Anne-Marie Hubert-Delplace et Henri Hubert

Un atlas des étoiles Be   An atlas of Be stars

Observatoire de Paris-Meudon   Paris-Meudon Observatory

Observatoire de Haute-Provence   Haute-Provence Observatory

q523.8
H86a

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Anne-Marie Hubert-Delplace / Henri Hubert

Paris-Meudon Observatory

Printed with the assistance of
Centre National de la Recherche Scientifique
and
International Astronomical Union

ERRATA

READ:

-p.13	HD 37657	$H\alpha$,...($H\gamma$) very variable emission;$H\gamma$ and $H\delta$ sometimes exhibit a sharp dark core.
-p.26	HD 61224	;R_{1950}= 7h35.4m,...
-p.40	HD 218393	This star was observed from 1954 to 1976.
-id.(*last but one line*)		...;they are particularly strong toward the maximum of strength of the hydrogen shell,...

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Physics

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PREFACE

We warmly thank all the people who by their help or interest contributed greatly to the production of this Atlas of Be stars, particularly the following :

– Dr. R. HERMAN, who initiated the study of Be stars at the Meudon Observatory and in 1953 undertook the campaign of observations at the Haute Provence Observatory. We are indebted to her for having given us the benefit of her great experience and put a large amount of observational material at our disposal.

– Pr. C. JASCHEK and Dr. M. JASCHEK, whose support and valuable suggestions have been very important.

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Finally we should like to thank the firm S.E.P.G. - Clichés Union, particularly Mr. M. HUYGUE and his collaborators, whose deep interest in the project, outstanding abilities, and understanding of our problems have improved the result.

– We also thank the editors of the journal **Astronomy and Astrophysics** and of the magazines **Astronomie** and **A.F.O.E.V.**, for advertising the Atlas.

Automn 1978

Anne Marie HUBERT-DELPLACE
Henri HUBERT

INTRODUCTION

1 - PRESENTATION

The study gives the spectral variations of 148 northern hemisphere ($\delta > -20^{\circ}$) emission line stars, of spectral type O8 to A2, brighter than seventh magnitude ($V \leqslant 7.0$).

From each of the 35 of them that were considered the most typical, the corresponding photographs are reproduced, illustrating the spectral variations.

Most of the 148 Be stars in this Atlas were observed regularly from 1953 at the Haute Provence Observatory (C.N.R.S.), at the Newton focus of the 120 cm telescope. This long campaign of observations was undertaken by Dr. R. HERMAN and followed by her research group. About sixty per cent of the observations were made by Dr. HERMAN and Mr. M. DUVAL ; thirty per cent, with equal participation, by Dr. M. LACOARRET, Dr. RAKOTOARIJIMY, and the authors, and ten per cent by various other observers. The program of observations of emission-line stars, developed by Dr. HERMAN, was based on the Merrill and Burwell catalogues (1933, 1943, 1949) ; some B stars whose Hα absorption was reported as particularly weak by Mohler (1940) were added, as well as some O and B stars pointed out as peculiar in the HD catalogue.

The program thus included a total of 204 stars that were for the most part observed annually or biannually except during the period 1965-1968. Excluded from the total for the purposes of this Atlas were the hotter O stars, the A stars latter than A2, the Wolf-Rayet stars, the supergiants whose frequency of variation of emission lines cannot be established from the periodicity of the observations, and the stars β Lyr and P Cyg, whose spectacular features do not fall within the interests of this study. Thus, 148 stars in the O8 to A2 range remain, all of which have or had definite emission features.

a) Scientific purpose

We have attempt to produce a basic document by using the approximately 10 000 spectrograms, spaced out over 23 years of observations, which were at our disposal. These were easily utilizable to study emission features, their variations, and the time scale of these variations, and to establish some comparisons between the behaviour of these objects, to try to draw up subgroups by analogy of variations, and, when appropriate, to relate these subgroups to spectral type, luminosity, and rotational velocity of the stars.

b) Method

The presentation of photographic plates of stellar spectra seemed to us the quickest and the most readable practice. The method of microphotometric tracing is very reliable, but it is not feasible to juxtapose on a limited surface a great many tracings, usually covering 23 years of observations, in order to give an overview of the evolution of a total phenomenon.

On the other hand, particularly in the case of spectra taken with a low dispersion, a narrow, weak line is usually, on a microphotometric tracing, lost in background noise. This noise is produced by the graininess of the photographic plate, which generates irregular fluctuations of the recording apparatus, the width of the analysing slit being optimized between the width of the narrowest line to be analyzed and the diameter of the silver clumps of the photographic plate.

To perceive the presence of a line in a spectrum, one must be able to distinguish a difference in density between a point of the line and a part of the neighbouring continuum. For this line to be visible, the variations in density must be larger than the statistical fluctuations due to the grain of the photographic plate. With our method of juxtaposing photographic prints, the same weak line, if it is reproduced on several spectra, becomes very readable. This method proves to be very practical in the case of metallic shell stars, whose lines are generally narrow and not very far apart, and also allows the doubtful traces caused by scratches or grains of dust to be ruled out.

2 - TECHNICAL DATA

a) Instrument

The spectra originated from observations at prism spectrograph C, attached at the Newton focus of the 120 cm telescope of the Haute Provence Observatory (C.N.R.S.). The main characteristics of this spectrograph, which were described by Boulon (1963), are as follows :

- collimator : $F \simeq 400$ mm opened at f/5.7, diaphragmed at f/6 (aperture ratio of the telescope)
- camera : $F \simeq 215$ mm
- prism : dense flint glass FDC 2036,
  - $n = 1.6510$ ($\lambda = 4047$ Å)
  - $n = 1.6424$ ($\lambda = 4358$ Å)
  - angle = 66° at the minimum of deviation
  - $\lambda = 5100$ Å, $i = i' = 63^{\circ}45'$.

The width of the entrance slit used for our observations was about 30 to 40μ (15 to 20μ on the plate) ; the height of the projected slit on the plates was 0.6 to 0.8 mm ; the spectral wavelength range studied was $\lambda\lambda$3900-6600 ; and the dispersion was 52 Å/mm at Hϵ , 60 Å/mm at Hδ , 77 Å/mm at Hγ , 120 Å/mm at Hβ , and 300 Å/mm at Hα .

On the spectrograms, the sharpness and the dispersion at Hα is not sufficient to allow conclusions to be drawn about the profile of this line ; we have noticed that when emission is strong the line is often degraded on its violet wing but distinct on the red side.

Though the photographic plate is slanted with relation to the optical axis of the spectrograph in order to correspond to the focal curve (Fig. 1), there are some failures to bring into focus the uttermost ends, i.e. wavelengths below λ 3800 and above λ 6000. For this reason, we could draw from the examination of the Hα line information only about the presence or the absence of emission.

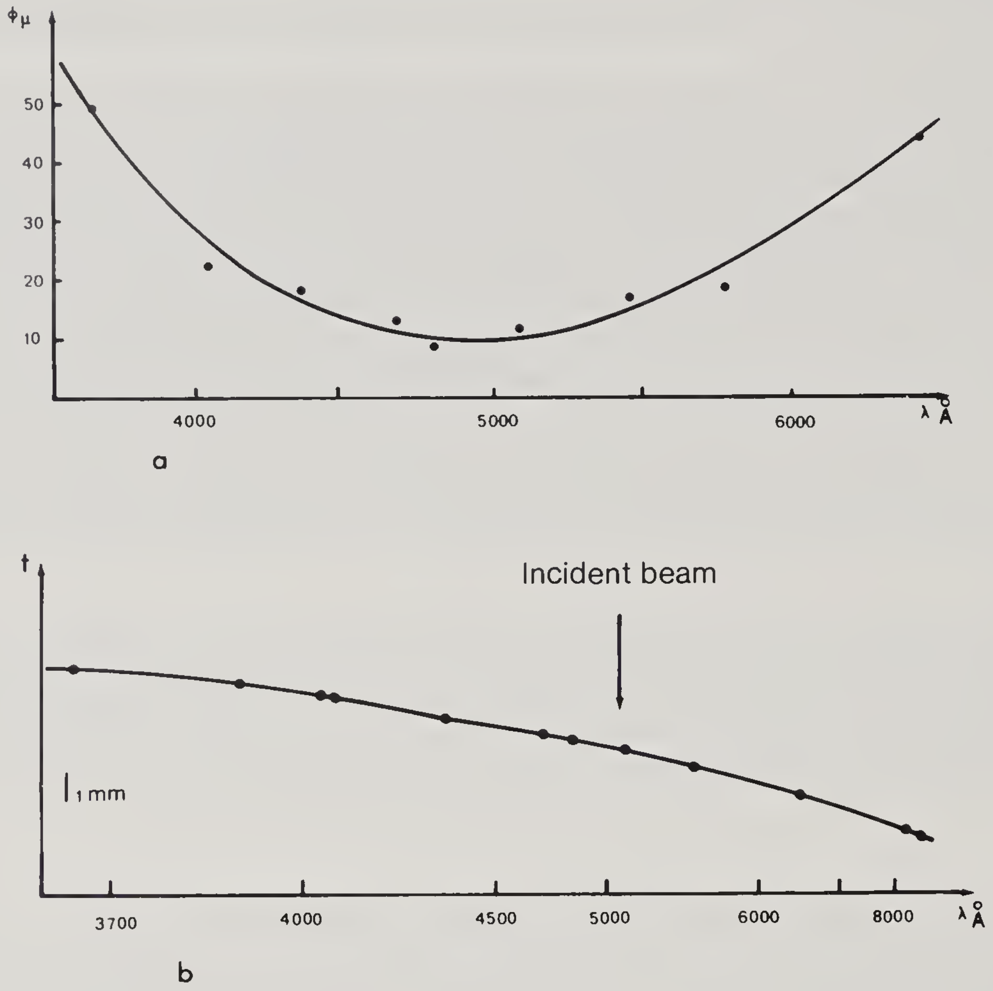


Fig. 1 Spectrograph C
a) Diameter of least aberration circle
b) Focal curve (t = focal length)

At the beginning of the observations, the exposure time was estimated by the observer. Greater regularity in the density of the spectrograms was obtained from 1969 on by the addition of an exposure meter.

The exposure times range, on an average, from 30 sec for a star of magnitude 3.0 to 45 min for a star of magnitude 7.0 ; the times vary around these average values according to the quality of the images.

b) Photographic material

Until 1960-1961, the spectrograms were obtained on Super-Panchro and Kodak 103a-F plates. The use of Super-Panchro plates was stopped because of their very low spectral sensitivity in the wavelength range λλ 6450-6600, which did not allow accurate estimates of the behaviour of the Hα line. The 103a-F plates, of high contrast and average resolving power (80 lines/mm), were as often as possible replaced because of their strong graininess, by Kodak IIa-F plates, which are half as fast as former but which have average contrast, better resolving power (100 lines/mm), and less graininess in our conditions of use and development.

The two types of plates are both corrected for long exposures, i.e., for failure of the reciprocity law, and record the same spectral range. An illustration of inhomogeneity in the spectral sensitivity of the Kodak IIa-F and 103a-F is given in Fig. 2. These curves were obtained by exposing each sample, with the auxiliary spectrograph ETA of the Haute Provence Observatory, to the radiation of a tungsten lamp (grey body ≃ 3200°K) modulated by a rotating-sector which transmits the light in a geometric progression ratio : 1.33, $\Delta \log I = 0.125$.

These curves are cut off at wavelengths below λ 4200 because of the color temperature of the tungsten lamp, whose radiation fails in intensity in the short wavelength range, in contrast with the radiation of the hot stars studied here, whose temperature is much higher (Fig. 3). Except for that difference of temperature however, the curves of Fig. 2 exhibit the behaviour of the stellar continuum observable of the spectral plates as well as the lack of spectral sensitivity in the range λλ 5000-5500 and λλ 6500-6700, where Hα is situated.

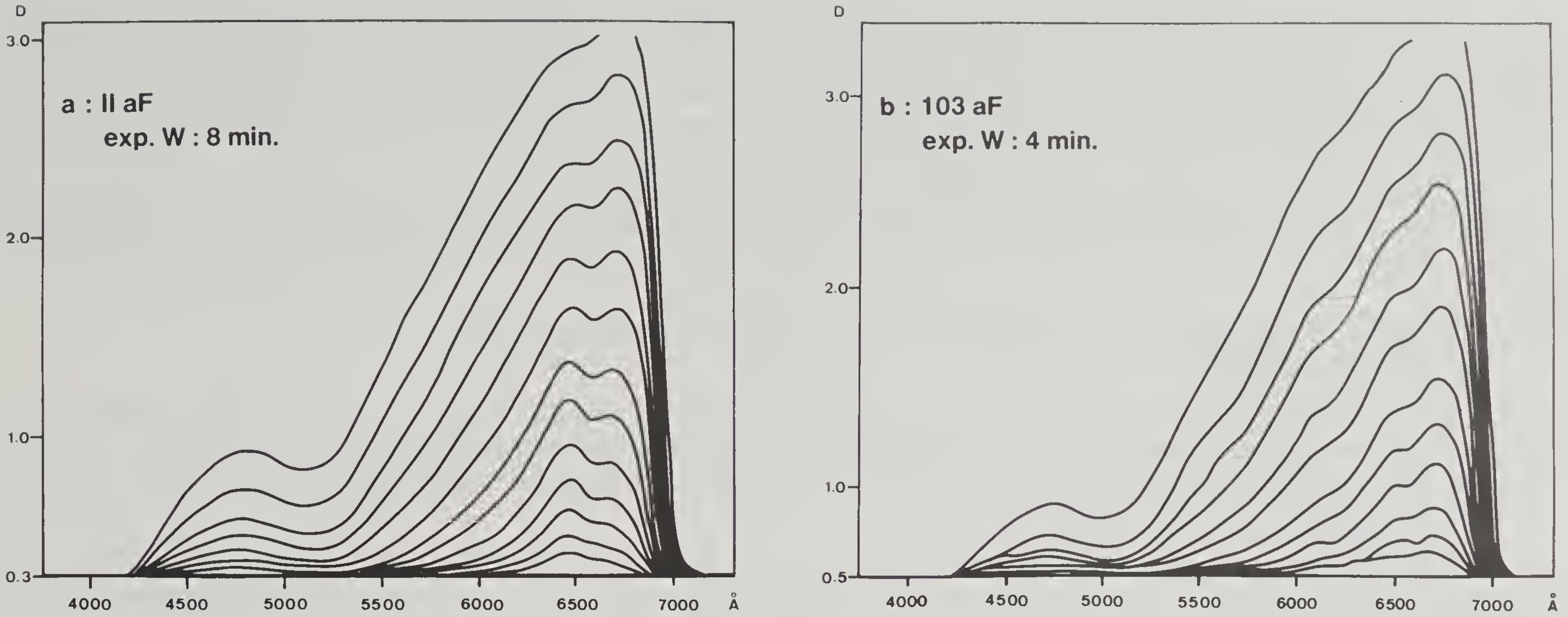


Fig. 2 Density curves, obtained with a tungsten lamp, versus wavelenth for illumination of steps with a ratio corresponding to $\Delta \log I = 0.125$
a) for a IIa-F plate, exposure 8 min.
b) for a 103a-F plate, exposure 4 min.

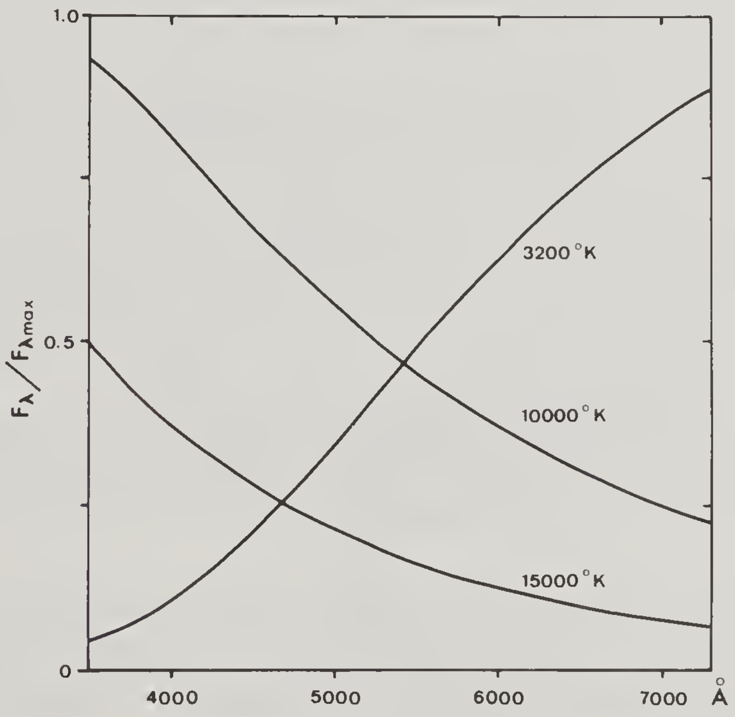


Fig. 3 Distribution of flux emitted by a black body, for temperatures of 3200°K, 10000°K, and 15000°K, in the spectral wavelength range 3500-7200 Å (fluxes are normalized to the maximum flux value $F\lambda max$).

Every plate was developed in Kodak D-19 or D-19b developer, and contains about 7 or 8 spectra, on an average, of different Be stars and a photometric calibration obtained with a « Soleillet » auxiliary spectrograph provided with a gradation apparatus described by Barbier (1944). The gradation of the light beam was done with a diaphragm limited by exponential curves. The calibration spectra were obtained by using a mercury-vapour lamp and a cadmium lamp. The usable wavelengths are the Hg lines λλ 3660, 4047, 4358 and 5460, and the Cd line λ 6438.

Each stellar spectrum was magnified without an intermediate negative in order to preserve the respective intensities of various stellar lines, both with regard to others of the same kind and from one spectrum to another one, for plates of the same type and of comparable density of the stellar continuum, which is important during the change from the Be star to the B star phase.

The final result submitted for printing is very close to the original document.

c) Caution to the reader

The shifting of lines which appears on the spectrogram plates signifies not stellar variations, but dimensional changes of the photographic paper arising during the drying, and tiny variations of the photographic enlargement over time.

There are some differences of contrast between the various spectrograms ; these are due to

a) changes in plate type (SP, 103a-F, IIa-F)

b) over or underexposure of the original spectrograms. In most cases such originals were set aside, except when a part of the information they contained was usable with the usual precautions, or when they represented the only information. We have obviously taken careful account of these parameters in the observational part of the Atlas.

Furthermore, the plates cannot be used to determine radial velocities because of the very frequent lack of appropriate reference lines.

3 - THE ATLAS

a) Description of the booklet

We give the nomenclature of each of the 148 Be stars accompanied by a description of spectral features and of their variations during the period of observations at the Haute Provence Observatory, in most cases from 1953 up to and including 1976. In the nomenclature we mention the HD number of the star in the Henry Draper catalogue, the name of the star, if need be its MWC number in the Mount Wilson catalogue, the coordinates right ascension and declination 1950.0, and the spectral type determined by Dr. M. Jaschek (ref. 1) using the criteria of the Morgan-Keenan classification ; in several cases we also give the spectral type determined by Dr. R. Herman (ref. 2) using the criteria of the Herman-Rojas classification (1955), based on the Hγ, Hδ, and Hϵ photospheric lines. The classifications given by Drs. Jaschek and Herman were made using the same observational material that we used. The standard stars were all observed in the same conditions. Then we give the v sin i value of the rotational velocity, from the catalogues of Uesugi and Fukuda (1970) and Uesugi (1978), and the photometric indices U, B-V, and U-B averaged by Nicolet (1978). When the V magnitude is known to be variable we mention the fact, and, finally, we mention if the star is known to be a binary and give the value of the period, as reported by Bidelman (1976).

In the description of spectral variations, we have taken care to specify the nature of the emission lines, their variations, and the temporary or permanent presence of a hydrogen shell (narrow, deep core on photospheric lines), sometimes accompanied by metals whose nature and ionization state are specified ; the strengthening of some absorption lines, such as the HeI, MgII, SiII, CaII, and NaI lines, is reported. The presence of the NaI and CaII interstellar lines is also mentioned. When the spectral variations are of the order of several decades, they are called « long-term » variations ; when they are of the order of several days, they are called rapid or « short-term » variations.

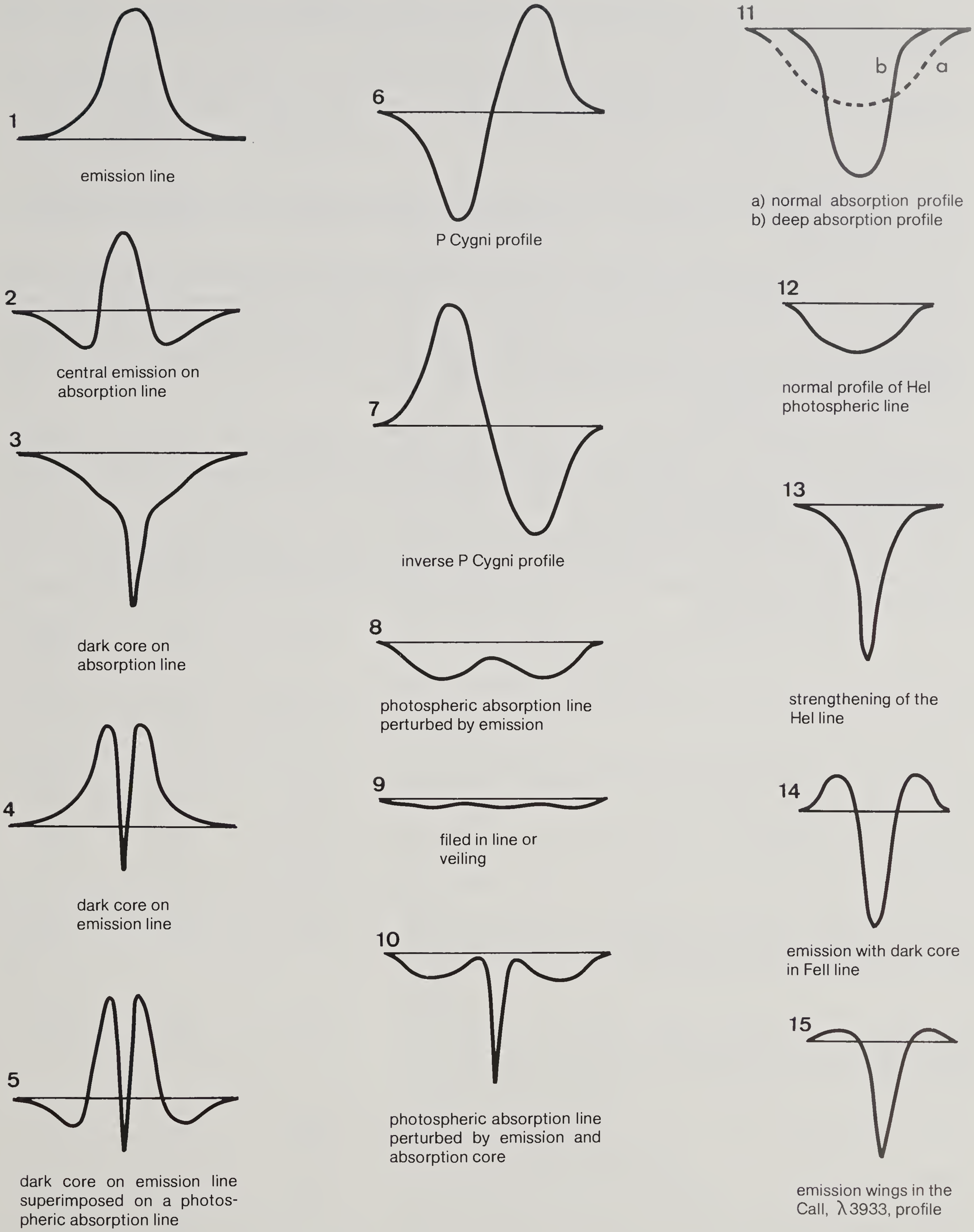
Illustrated in Fig. 4 are the various types of line profiles. There we give examples : 1) of hydrogen lines disturbed by emission, or by sharp dark core due to a shell, or by both at once ; 2) of variable absorption lines such as the hydrogen, HeI, and MgII lines, as they sometimes appear for certain stars ; 3) of shell lines disturbed by emission, as the FeII lines are often seen and very rarely the K line of CaII.

Several stars have often been studied in detail. We merely mention this fact, giving no reference to such studies because they are sometimes numerous and are beyond the scope of this Atlas. We refer readers to the bibliographical references in Merrill an Burwell (1933, 1943, 1949) Jaschek et al. (1971), and Cayrel et al. (1978), and to the I.A.U. Symposium n° 70, « Be and shell stars », edited by Slettebak (1976).

In the cases where the description of the star is accompanied by reproductions of photographic plates, we note « see illustration ». Finally a table summarizing the observations of the 148 Be stars is given (Table 2), but the number of annual observations of each object is not indicated. In this table, stars for which photographic plates are reproduced have been underlined.

b) Description of the photographic prints

The Atlas contains 51 reproductions of photographic spectra of 35 hot stars with emission lines. Some particularly interesting stars have been observed more frequently and therefore are represented by several plates.



emission line

central emission on absorption line

dark core on absorption line

dark core on emission line

dark core on emission line superimposed on a photospheric absorption line

P Cygni profile

inverse P Cygni profile

photospheric absorption line perturbed by emission

filed in line or veiling

photospheric absorption line perturbed by emission and absorption core

a) normal absorption profile
b) deep absorption profile

normal profile of HeI photospheric line

strengthening of the HeI line

emission with dark core in FeII line

emission wings in the CaII, λ3933, profile

Fig. 4 Illustration of different types of observed profiles a) of the Balmer lines : 1-11 ; b) of the HeI and MgII lines : 12-13 ; c) of the FeII lines : 14 ; d) of the CaII K line : 15.

On each reproduction, the epochs of observation (day, month, year) are shown on the ordinate ; when several spectrograms were taken on the same day, there is no change of epoch. The wavelengths of the most important lines and the identification of the corresponding element and its ionization state are given.

Seitter's « Atlas for objective prism spectra I » (1970) was used as the reference for the location of stellar lines. For identification of circumstellar lines, we usually used microphotometric tracings referring to that of star HD 142983 (48 Lib), for which the identification of the lines is well known (Struve, 1943).

As the reproductions are negative of the plates used, emission lines appear as white, or « bright », lines, and absorption lines appear as black, or « dark », lines.

Table 1 groups the 35 stars whose spectral variations figure in the prints of this Atlas ; they are arranged in order to decreasing MK spectral type (ref. 1), and their spectral features are summarized. The Herman-Rojas classification (ref. 2) is also given for comparison.

The following explanations apply to Table 2. a) A question mark behind the Herman-Rojas classification indicates that the imprecision is related to the determination of spectral type and luminosity class. b) The notation B→ Be shows that the star, during these observations, is first in a « B star » and then in a « Be star » phase. c) The rotation B ⇄ Be shows that the star goes from a « B star » to a « Be star » phase and back. In addition every line affected by emission is noted. Of the hydrogen lines, $H\alpha$ is more often than not a simple emission line ; the other lines exhibit a central emission component superposed on a broad photospheric absorption, except in some cases when the $H\beta$ and more rarely $H\gamma$ lines are also simple emissions. When emission is not always visible on a line, this line is given in parentheses. When emission is only suspected, the designation of the line is followed by a question mark.

The prints of the Atlas illustrate : 1) Be stars which are in relatively « quiet » phases (e.g., HD 212571, HD 32343, HD 224559, and HD 21641) ; 2) Be stars in « very active » phases (e.g., HD 184279, HD 200120, and HD 23862) ; 3) stars which are sometimes in a « B star » phase, sometimes in a « Be star » phase (e.g., HD 33328, HD 171406, and HD 201733) ; 4) Be stars with permanent and relatively stable shells (e.g., HD 217050, HD 22192, and HD 195325) ; and 5) Be stars with temporary shells (e.g., HD 200120, HD 23862, and HD 162732).

For phases of the same nature, there is generally great similarity between emission features of stars of the same or similar spectral types (e.g., HD 202904 and HD 32343 ; HD 171406 and HD 171780 ; HD 199218 and HD 224544).

To separate Be stars from shell stars is difficult ; often a Be star exhibits a shell temporarily, as is the case for HD 200120, HD 201733, and HD 23862.

c) Table 1 - Summary of stars illustrated in the Atlas

Star HD	Classification MK, ref. 1	Classification Herman-Rojas ref. 2	Summary of description
203064	O8	O9	Oe→ O ; during the « Oe phase » only Hα is an emission line.
24534	O9.5 V	O9-B0	Strong emission lines ; Hα ,... (H8), FeII, HeI λ 5876, HeI-FeII $\lambda\lambda$ 5016-5018 emission, strong « veiling » effect - variable emission features ; strong decrease of emission from 1971, when the HeI absorption lines, previously hardly visible, become very distinct.
45314	O9-B0?		Hα ,...Hγ , HeI 5876 Å variable emission ; hydrogen shell during the minimum of emission.
184279	B0.5		B→ Be ; during the « Be phase », Hα is in emission and the variable Hβ profile is sometimes disturbed by emission ; a hydrogen and temporary HeI and FeIII shell is also observed ; at the maximum of the shell strength, Hβ has a reversed P Cyg profile.
200120	B1V	O9V?	Hα, ...Hγ , FeII emission lines. From 1971 to 1976, very large changes, spectacular strengthening of emission - all the H, HeI, MgII, SiII, and FeII lines are affected - followed by a phase with a very strong shell composed of H, HeI, MgII, SiII, FeII, NaI and CaII ; HeI λ 5876 remains in emission ; then gradual decrease of emission and disappearance of the shell. In 1976 Hα is not visible.
212571	B1V	B0.5III?	Hα, ...(Hδ), FeII emission, slow variation ; sometimes Hγ or Hδ has a sharp dark core.
202904	B2V	B2V-IV	Hα, ...(Hδ), FeII emission, slow variation with minimum.
212076	B2V	B2IV	Hα, ...Hδ variable emission ; at the minimum of emission, Hβ , Hγ , and Hδ exhibit a sharp dark core.
33328	B2IV	B2.5III-IV	B ⇄ Be ; Hα is very variable ; Hβ and Hγ sometimes exhibit a sharp dark core.
191610	B2.5IV-V	B3.5V	B→ Be ; during the « Be star » phase, Hα and Hβ are variable emissions ; Hβ and Hγ sometimes exihibit a sharp dark core.
32343	B3V	B3V	Hα, ...H8?, FeII emission not very variable ; weak minimum in 1961.
37657	B3Vn	B3-4V	Hα ,...(Hγ) very variable emission ; Hβ sometimes exhibits a sharp dark core.
203025	B3III	B3III	Hα , (Hβ) variable emission ; Hβ sometimes exhibits a sharp dark core.
217050	B3III	B2III	Hydrogen and metallic shell always observed, Hα ,... Hδ ? FeII emission. Hydrogen lines and emission FeII lines exhibit a sharp dark core. The strength of the shell lines, especially MgII, SiII, NaI, and CaII, fluctuates rapidly.
142983	B3III	B2.5III?	Hydrogen and metallic shell strongly variable, Hα ,... Hγ emission ; the Hβ profile is very complex, of P Cyg, symmetrical, or reversed P Cyg type ; hydrogen lines always exhibit a sharp dark core of variable strength, whereas metallic shell lines are not always seen ; the NaI and CaII absorption lines vary greatly.
22192	B4V	B5IV?	Hydrogen shell always present but of rather variable strength ; Hα, ... Hδ , FeII emission, weak variation.
224559	B4Vn	B4V	Hα, ...(Hγ) emission, slow variation ; at the maximum of emission some FeII emission traces are observed.
201732	B4IV		Be ⇄ B ; during the « Be phase », Hα , Hβ , and sometimes Hγ exhibit a very variable emission ; a hydrogen shell is often seen.
43285	B5V	B6V	Hα ,...(Hγ) variable emission ; the absorption lines MgII and SiII $\lambda\lambda$ 4128-31 are variable.

171406	B5V	B5-B6V	Be ⇄ B ; during the « Be phases » only Hα is in emission ; Hβ and Hγ sometimes exhibit a sharp dark core.
698	B5III		Spectroscopic binary ; a hydrogen and (weak) metallic shell is always present ; Hα is in emission and Hβ is disturbed by emission ; the HeI, MgII, SiII, CaII and NaI absorption lines are narrow and strong.
171780	B6V	B7V	B ⇄ Be ; during the « Be phases », Hα and (Hβ) are in variable emission ; Hβ or Hγ sometimes exhibits a sharp dark core ; the MgII and some HeI absorption lines seem to vary.
224544	B6Vn	B7IV?	Hα ,...(Hγ) emission, slow variation, at the maximum some FeII emission lines are observed ; Hγ and sometimes Hδ exhibit a sharp dark core.
199218	B6Vn	B7V	Hα ,Hβ emission, no variation ; sometimes Hγ and Hδ exhibit a sharp dark core.
162428	B7Vn	B7V	Hα , Hβ emission, slow variation ; temporary and very variable hydrogen shell ; in 1954 metallic shell lines are observed ; the NaI and CaII absorption lines seem very variable.
22780	B7Vn		B ⇄ Be ; during the « Be phase », Hα , (Hβ) are variable emission, Hγ very sporadically exhibits a sharp dark core.
6811	B7III	B9III	Hα emission, slow variation.
162732	B7	B6V?	Spectroscopic binary ; Be → B ; during the « Be phase », Hα is an emission, Hβ also seems disturbed, and hydrogen and metallic shell is always present ; the metallic shell lines disappear when Hα becomes a weak emission, whereas the hydrogen shell lines disappear only when Hα is a marked absorption ; the NaI and CaII absorption lines are always very strong during the emission phase.
142926	B7	B8V	B → Be ; during the « Be phase », Hα is an emission, Hβ also seems disturbed, and a hydrogen and metallic shell appears ; the NaI, CaII, MgII, and SiII absorption lines strengthen just before the appearance of emission.
23862	B8	B8IV	Hα ,...Hγ variable emission ; FeII in emission to 1968 ; large decrease of emission in 1971 and appearance of a strong hydrogen and metallic shell, the NaI and CaII absorption lines become very strong.
193182	B8		Strong hydrogen and metallic shell always present and not very variable ; Hα is an emission and Hβ is also disturbed ; the NaI and CaII absorption lines are particularly strong.
21641	B9Vn	B9V	Hα , Hβ emission, not many changes.
205551	B9III	B9III	Hα weak emission, not many changes.
195325	A0	A0IV?	Very strong hydrogen and metallic shell (at this dispersion Hα is an absorption) ; The NaI and CaII absorption lines are particularly strong.
41511	A2	A0III?	Spectroscopic binary ; very strong hydrogen and metallic shell ; Hα is a weak emission ; the NaI and CaII absorption lines are very strong.

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DESCRIPTION OF STARS

– **HD 144**, 10 Cas, MWC 2 ; R_{1950}= 0h03.8m, D_{1950}= +63°55' ; sp. t. B9III(1,2) ; v sin i = 150 kms $^{-1}$; V=5.59, B–V=–0.03, U–B=–0.11.

Observed from 1953 to 1969, this star does not exhibit any emission features at this dispersion ; its spectrum looks like that of a B9III star. Hα is a distinct absorption line. From 1970-1971, Hα is a weaker absorption line, and at a higher dispersion is seen to have a centrally superposed narrow emission component of low intensity.

– **HD 698**, MWC 4 ; R_{1950}= 0h09.0m, D_{1950}= + 57°56' ; sp. t. B5III(1) ; V=7.08, B–V=+0.18, U–B=–0.40 ; spectr. bin. P=55.9 d.

Observed from 1953 to 1976, this star does not noticeably vary. Hα is a strong bright line, and the wings of Hβ, partially neutralized by emission, are unusually weak. Hydrogen and metallic shell lines (FeII, TiII) are observed on every spectrogram. The Hβ to H9 lines have conspicuous, sharp dark cores ; on the other hand, the metallic shell lines are weak. The HeI, MgII, SiII and NaI absorption lines are particularly sharp and distinct. The CaII K line is strong (see illustration).

– **HD 4180**, 22*o*Cas, MWC 8 ; R_{1950}= 0h41.9m, D_{1950}= +48°01' ; sp. t. B5III(1) ; v sin i = 260 kms^{-1} ; V=4.54, B–V=–0.07, U–B=–0.51.

Observed from 1953 to 1976, this star is sometimes in a « B star » phase, at other times in a « Be star » phase. The width of the wings of the hydrogen absorption lines varies greatly. From 1953 to 1959, Hα is an absorption line ; at the end of 1960, it is not distinguished from the continuum, and in 1962 a faint absorption is observed. At the end of 1963, Hα is an emission line, and at the end of 1964 it is a faint emission line superposed centrally on a broad absorption line. In 1968 it is again a faint absorption line, and in 1971 it has some very fast fluctuations of intensity. The Hα absorption is more distinct from 1972 to 1975 ; in 1976 the absorption line is broad and has a centrally superposed emission line. At the maximum intensity of the Hα emission line (1964-1965 and 1976), sharp dark cores owing to a weak shell are seen on the Hβ and Hγ lines, which are also disturbed by emission.

– **HD 5394**, γ Cas, MWC 9 ; R_{1950}= 0h53.7m, D_{1950}= + 60°27' ; sp. t. B0.5IV?(1), B0II?(2) ; v sin i = 230 kms^{-1} ; V=2.47 var, B–V=–0.15, U–B=–1.08.

Observed from 1953 to 1976, this star exhibits large changes in emission and occasionally a hydrogen shell.

In 1953, Hα and Hβ are emission lines, Hγ and Hδ cannot be distinguished from the continuum, and the other hydrogen lines are hazy absorption lines. HeI λ 5876 is bright, and the other HeI lines are dark and weak ; some traces of FeII emission lines are found.

From 1956 to 1958, the emission weakens slightly, Hγ gradually appears as a weak absorption line, and a faint hydrogen shell appears centrally on the Hδ, Hϵ, and H8 lines. At the end of 1960, the hydrogen shell is strengthened as the emission continues to weaken ; HeIλ 5876 is barely visible and the Hβ line is no longer distinguished from the continuum.

At the end of 1961, the emission is strengthened : Hβ again shows an emission component, Hγ is not distinct from the continuum, and the hydrogen shell has become fainter. From the end of 1963, hydrogen emission gradually strengthens and becomes visible to Hγ. A « veiling » of the other hydrogen lines is observed, the hydrogen shell, visible centrally on the Hδ and Hϵ lines, becomes fainter ; FeII and HeIλ 5876 are bright. In 1973 and 1974, a maximum of emission is observed. From 1975, the emission again becomes fainter, particularly in the FeII and Hγ lines. In 1976, only Hα, Hβ, and HeIλ 5876 are bright ; the veiling effect has disappeared.

– **HD 6343**, MWC 10 ; R_{1950}= 1h02.6m, D_{1950}= +65°42' ; sp. t. B7V(1), B8.5IV- V(2) ; V=7.26, B–V=+0.16, U–B=–0.24.

Observed from 1953 to 1976, this star does not reveal any noticeable changes at this dispersion. Hα is a moderately intense emission line, and Hβ is a very weak emission line superposed centrally on a broad absorption.

– **HD 6811,** φ And, MWC 420 ; R_{1950}= 1h06.6m, D_{1950}= +46°59' ; sp. t. B7III(1), B9III(2) ; v sin i = 70 kms^{-1} ; V=4.25, B–V=–0.07, U–B=–0.34 ; bin.

Observed from 1954 to 1976, this star exhibits a weak and variable emission, visible only on the $H\alpha$ line. From 1954 to 1956, $H\alpha$ is a very faint absorption line ; from 1958 to 1960, it is not distinguished from the continuum. In 1961-1962, $H\alpha$ is a very faint emission superposed centrally on a wider absorption ; from 1963, the $H\alpha$ emission line gradually strengthens. From 1968 to 1975, $H\alpha$ is a fairly narrow but low-intensity emission (see illustration).

– **HD 9709,** MWC 426 ; R_{1950}= 1h33.0m, D_{1950}= +46°51' ; sp. t. B8V(1,2) ; v sin i = 350 kms^{-1} ; V=7.0.

Observed from 1953 to 1976, this star exhibits a slow strengthening of the emission, clearly visible in the $H\alpha$ and $H\beta$ lines. To 1964, $H\beta$ shows a faint emission line superposed centrally on a broad absorption ; then this emission becomes stronger, and in 1971 some FeII emission traces are observed. During this enhancement of the emission (1964-1974), some traces of a hydrogen shell are seen centrally on the $H\gamma$ and $H\delta$ lines. After 1974, the emission becomes slightly fainter, and the hydrogen shell disappears.

– **HD 10516,** φ Per, MWC 16 ; R_{1950}= 1h40.5m, D_{1950}=+50°26' ; sp. t. B1V(1), O9.5V?(2) ; v sin i = 450 kms^{-1}; V=4.07 var, B–V=–0.04, U–B=–0.93 ; spectr. bin. P = 126.6 d.

Observed from 1953 to 1976, this star exhibits a strong emission in the Balmer and FeII lines ; a « veiling » effect is observed in the blue-violet spectral range. This binary star is well known to occasionally have a shell of hydrogen and neutral helium.

The hydrogen shell appears twice during a binary cycle, the HeI triplets and λ 3965 becoming stronger during the second enhancement of the hydrogen shell.

Our observations show a strong, wide bright $H\alpha$ line, a rather strong bright $H\beta$ line, and an emission line superposed centrally on a broad absorption diminishing in intensity from $H\gamma$ to $H\epsilon$. The FeII lines are bright and strong. Although our observations made at a rather low dispersion are not appropriate for a study of the strength of the hydrogen shell lines, when identical phases are compared the shell lines seem to be less strong after 1970, as are HeI $\lambda\lambda$ 3888, 3965 (the most typical), 4026, 4471, and 5876 and the CaII K line.

A strengthening of these shell lines is visible on the plates made on 18 October 1953, 9 and 12 October 1960, 3 and 7 December 1960, and 16 November 1964.

– **HD 11606,** MWC 21 ; R_{1950}= 1h52.3m, D_{1950}= + 59°02' ; sp. t. B1Vn(1), B1V?(2) ; V= 7.02, B–V= +0.06, U–B=–0.86.

Observed from 1953 to 1976, this star exhibits a slow enhancement of the emission. From 1953 to 1958, $H\alpha$ is a strong bright line, $H\beta$ a moderate bright line, and $H\gamma$ a rather broad and hazy absorption. From 1960, $H\beta$ becomes a strong bright line, and $H\gamma$ is seen as an emission line centrally superposed on a broad absorption ; some traces of FeII emission lines gradually appear. From 1971, a weak emission is observed centrally on the $H\delta$ absorption line. During this enhancement of the emission, some traces of a hydrogen shell are sometimes seen on the $H\delta$ line, as in November 1961 and February 1969. The NaI and CaII absorption lines, which are very narrow, are visible.

– **HD 18552,** MWC 455 ; R_{1950}= 2h57.0m, D_{1950}= +37°56' ; sp.t. B8Vn(1), B8V(2) ; v sin i = 320 kms^{-1}; V=6.1,B–V=–0.06, U–B=–0.38.

Observed from 1953 to 1976, this star exhibits an enhancement of the emission lines ; until 1964, $H\alpha$ is a strong bright line and $H\beta$ appears as a very weak emission line on a broad absorption. In 1968 the $H\beta$ emission component becomes stronger and sometimes the FeII lines are weakly bright, quite well observed between $\lambda\lambda$5000 and 5350. Occasionally some weak traces of a hydrogen shell are seen on the $H\gamma$ and $H\delta$ lines, as in 1960-1962.

– **HD 19243,** MWC 61 ; R_{1950}= 3h04.8m, D_{1950}= +62°12' ; sp. t. B1III-IV(1), B1II?(2) ; V=6.62, B–V= +0.26, U–B=–0.65.

Observed from 1953 to 1976, this star exhibits a gradual enhancement of the Balmer and FeII emission lines. In 1953-1954, $H\alpha$ is a strong, broad bright line, $H\beta$ is a moderate bright line, and $H\gamma$ and $H\delta$ have sharp dark cores given by a hydrogen shell. In 1956 the emission is clearly apparent in the center of the $H\gamma$ line ; a shell is visible on the $H\delta$ line in 1960. A maximum of emission is seen between 1964 and 1974, and during that period the emission appears faintly in the center of the $H\delta$ line, while the FeII lines, which were faint emission lines from 1953 to 1964, become well defined between $H\gamma$ and λ 5350. The NaI and CaII narrow absorption lines are visible. In 1976 the emission in the spectrograms becomes fainter.

- **HD 20336,** MWC 65 ; R_{1950}= 3h15.6m, D_{1950}= +65°28' ; sp. t. B3Vn(1), B3V(2); v sin i = 350 kms^{-1} ; V=4.84, B–V=–0.15, U–B=–0.77.

Observed from 1954 to 1976, this star exhibits large changes in variation of the $H\alpha$ and $H\beta$ emission lines. From 1954 to 1958, $H\alpha$ is a strong emission line, $H\beta$ is a faint emission line superposed centrally on a broad absorption, and a variable hydrogen shell is observed on the $H\gamma$ and $H\delta$ lines. From 1960 to 1965, the bright $H\alpha$ line becomes fainter, and $H\beta$ is an absorption line with a sharp core and possibly some faint emission remaining on its wings, $H\gamma$ and $H\delta$ are distinct absorption lines. It is difficult to see definitive evidence of a shell at that time. From 1968 to 1973, $H\alpha$ is a very faint emission line, while the other hydrogen lines, particularly $H\beta$ and $H\gamma$, are deep, distinct absorption lines. From 1974, $H\alpha$ becomes stronger while the $H\beta$ absorption line is hazier and no longer contains a sharp core.

- **HD 21641,** MWC 727 ; R_{1950}= 3h28.0m, D_{1950}= +47°42' ; sp. t. B9Vn(1), B9V(2) ; v sin i = 190 kms^{-1} ; V=6.77, B–V=–0.02, U–B=–0.28.

Observed from 1957 to 1975, this star exhibits very few changes. $H\alpha$ is a moderate emission line, and $H\beta$ is a very faint emission line superposed centrally on an absorption line (see illustration).

- **HD 22192,** ψ Per, MWC 69 ; R_{1950}= 3h32.9m, D_{1950}= +48°02' ; sp. t. B4V(1), B5IV?(2) ; v sin i = 370 kms^{-1}; V=4.23, B–V=–0.06, U–B=–0.57.

Observed from 1957 to 1976, this star exhibits a strong emission in the $H\alpha$, $H\beta$, and FeII lines ; the $H\gamma$ and $H\delta$ lines are also disturbed by emission. Sharp dark cores owing to a shell are seen on the $H\gamma$, $H\delta$, and $H\epsilon$ lines.

The emission does not vary appreciably until 1971. From then on, the emission becomes very slightly fainter and there are some fluctuations of the shell components, particularly the $H\gamma$ line. At the end of 1976, this shell becomes much fainter and the FeII emissions are weaker (see illustration).

- **HD 22780,** MWC 463 ; R_{1950}= 3h37.9m, D_{1950}= +37°25' ; sp. t. B7Vn(1) ; v sin i = 360 kms^{-1}; V=5.57, B–V=–0.07, U–B=–0.41.

Observed from 1953 to 1976, this star first exhibits a « B star » phase to November 1964 and then a « Be star » phase from 1968 (there were no observation between 1965 and 1968). From 1968 to 1972, $H\alpha$ is a moderate bright line, and there seems to be a faint central emission on the $H\beta$ absorption line. In 1973 and 1974, $H\alpha$ is a faint emission line, whereas it is a weak absorption line in 1975, and 1976 (see illustration).

- **HD 23302,** 17Tau, Electra, MWC72 ; R_{1950}= 3h41.9m, D_{1950}=+23°57'; sp.t.B6III(1), B8.5IV-III(2) ; v sin i = 215 kms^{-1}; V=3.70, B–V=–0.11, U–B=–0.40.

Observed from 1955 to 1976, this star always has an $H\alpha$ absorption line of various strengths ; the absorption is weak until 1961 and is more distinct in 1964, 1968, and 1969. In 1970 and 1971, $H\alpha$ is a hazy absorption line, which becomes fainter in 1973 through 1976.

- **HD 23480,** 23 Tau, Mérope, MWC 73 ; R_{1950}= 3h43.4m, D_{1950}=+23°48' ; sp. t. B7III(1), B6.5IV- V(2) ; v sin i = 280 kms^{-1} ; V = 4.18, B–V=–0.06, U–B=–0.42.

Observed from 1953 to 1976, this star exhibits large changes in the $H\alpha$ emission line.

In 1953, $H\alpha$ is a narrow and rather strong bright line, $H\beta$ is a weak emission line centrally superposed on a photospheric absorption. From 1955 to 1961, $H\alpha$ is a weak emission line, while $H\beta$ is a strong absorption line. From the end of 1964 to 1970, $H\alpha$ is again a rather strong emission line, and $H\beta$ is a hazy absorption line.

From 1971 to 1975, the intensity of the $H\alpha$ emission line gradually becomes fainter, and $H\beta$ is a strong absorption line. In 1976, $H\alpha$ is again a weak emission line.

- **HD 23552,** MWC 464 ; R_{1950}= 3h44.6m, D_{1950}= +50°35' ; sp. t. B8V(1) ; v sin i = 250 kms^{-1} ; V=6.14, B–V=+0.06, U–B=–0.32.

Observed from 1954 to 1976, this star exhibits very few noticeable changes in emission. $H\alpha$ is a moderate bright line and $H\beta$ is a weak emission centrally superposed on a broad absorption line. Some faint traces of a hydrogen shell, seen on the $H\gamma$ line from 1972 to 1975, seem to be observed. The emission seems to become fainter after 1970. There is a slight maximum of emission between 1963 and 1970.

– **HD 23630,** 25 Tau, Alcyone, MWC 74 ; R$_{1950}$= 3h44.5m, D$_{1950}$= +23°57' ; sp. t. B7III(1), B8III(2) ; v sin i = 215 kms^{-1} ; V=2.87, B–V=–0.09, U–B=–0.34.

Observed from 1953 to 1976, this star does not exhibit any noticeable changes in emission on our plates, Hα is always a narrow bright line of moderate intensity.

– **HD 23862,** 28 Tau, Pléione, MWC 75 ; R$_{1950}$= 3h46.2m, D$_{1950}$= +23°59' ; sp. t. B8(1), B8IV(2) ; v sin i = 330 kms^{-1} ; V= 5.09 var, B–V=–0.08, U–B=–0.28.

Observed from 1953 to 1976, this star exhibits a change in emission, and the appearance in 1972 of a strong hydrogen and metallic shell.

From 1953 to 1957, an enhancement of the intensity of the emission is gradually observed, Hα is a strong and wide bright line, and Hβ is an emission of moderate intensity centrally superposed on a broad absorption. The FeII lines are also bright. In 1958-1959, an emission appears centrally on the Hγ absorption line. A maximum of the intensity of the emission is observed in 1960, followed by a gradual weakening. The FeII emission lines are very faint in 1964 and disappear in 1970 ; at that epoch the hydrogen emission lines become much fainter, and the Hγ emission line is not seen in November 1970.

The emission of the Hβ line disappears in November 1971, and Hα is an emission line of rather weak intensity. In 1972, Hα is not distinguished from the continuum and a hydrogen and metallic shell appears ; the CaII and NaI lines strengthen considerably. From 1973 to 1976, the emission again appears on the Hα and Hβ lines. Hα is a strong emission, the wings of the Hβ photospheric line are weak, disturbed by emission. The shell becomes strong ; many FeI, FeII, CrII, TiII, and SiII lines are observed (see illustration).

– **HD 24479,** MWC 77 ; R$_{1950}$= 3h53.0m, D$_{1950}$= + 62°56' ; sp. t. B9.5V(1), B9V(2) ; v sin i = 115 kms^{-1}; V=5.03, B–V=–0.09, U–B=–0.16.

Observed from 1955 to 1976, this star always exhibits the Hα line as an absorption feature ; however from 1961 on, the Hα absorption seems fainter ; with a higher dispersion, this line is seen as a very weak emission centrally superposed on a broad absorption.

– **HD 24534,** X Per, MWC 78 ; R$_{1950}$= 3h52.3m, D$_{1950}$= +30°54'; sp. t. O9.5V?(1), O9-B0?(2) ; v sin i = 150 kms^{-1} ; V= 6.10 var, B–V = +0.29, U–B=–0.82.

Observed from 1953 to 1976, this star exhibits a large change in emission.

From 1953 to 1956, Hα is a strong, broad emission line, Hβ a moderate one, and Hγ a weak one, while Hδ is a very weak emission line centrally superposed on a broad, hazy absorption. The other hydrogen lines are not seen, the « veiling » effect being very strong. The FeII and SiII $\lambda\lambda$ 4128-4131 lines are bright, wide and diffuse. The HeI λ 5876 line is bright, the $\lambda\lambda$ 4471-4026 and 4009 lines are weak absorption lines, and the other HeI lines are hardly perceptible.

From 1957 to 1960, all the emission lines already mentioned are strengthened. the « blend » of HeI and FeII $\lambda\lambda$5016-5018 becomes strong in emission. The « veiling » effect is still very strong and the HeI λ 4471 absorption line is hardly perceptible.

In 1961, there is a maximum of the intensity of the emission on the FeII lines, after which these lines again become hazy and weak ; they disappear toward the end of 1964, the other emission lines remaining strong. From 1971, the hydrogen, SiII, and HeI emission lines become fainter in their turn ; on our plates the emission is seen to Hδ and the « veiling » effect must have become weaker, because the other hydrogen lines are seen as a hazy absorption. The HeI lines appear in absorption except HeI λ 5876, which remains a weak emission, and the HeI-FeII blend $\lambda\lambda$5016-5018.

After June 1974, Hα is a moderate emission line, Hβ is a weak emission line, Hγ is a broad, hazy absorption line. The HeI λ 5876 line is still weak and bright and the blend HeI-FeII is still seen as a very faint emission trace (see illustration).

– **HD 25940,** 48 Per, MWC 81 ; R$_{1950}$= 4h05.0m, D$_{1950}$=+47°35'; sp. t. B3V(1), B4.5 V-IV(2) ; v sin i = 215 kms^{-1} ; V=4.04, B–V=–0.03, U–B=–0.55.

Observed from 1953 to 1976, this star exhibits a slight change in emission. Hα is a strong bright line, Hβ a moderate bright line centrally superposed on a broad absorption, Hγ a sharp, weak bright line on a broad absorption. Between 1963 and 1968, a maximum of intensity of the emission is observed, then a weak emission is present centrally on the absorption Hδ line.

– **HD 26398,** MWC 468 ; R$_{1950}$= 4h08.2m, D$_{1950}$ = +16°31'; sp. t. B7III(1), B6IV-V(2) ; v sin i = 180 kms^{-1}; V=7.0.

Observed from 1955 to 1975, this star exhibits a slight change in emission. Hα is a strong bright line, and Hβ is a faint emission line centrally superposed on a broad absorption ; during the maximum of the emission, from 1963 to 1968, a very faint emission at Hγ is centrally superposed on a broad absorption.

– **HD 28497**, 228 G Eri, MWC 86 ; R_{1950}= 4h26.8m, D_{1950}=–13°09'; sp. t. B2V(1,2) ; v sin i = 340 kms^{-1} ; V=5.60, B–V=–0.23, U–B=–0.89.

Observed from 1955 to 1975, this star exhibits good changes in emission lines as well as a temporary shell. In 1955, Hα is a strong bright line, Hβ a moderate bright line, and Hγ and Hδ are very hazy absorption lines, probably disturbed by the emission. A sharp core, due to a hydrogen shell, is visible on the Hγ and Hδ lines. In 1956, Hβ is a weak emission line centrally superposed on a broad absorption, and the emission seems to disappear from Hγ and Hδ ; on the other hand the shell is stronger. In 1957-1958, Hβ is a very weak, hazy absorption line, the shell is still present, and Hα is a moderate bright line. From 1960 to 1965, the emission gradually becomes stronger ; it is quite visible on the Hβ line. The shell becomes fainter in 1964. From 1968, the emission is strengthened very clearly. In 1971 it appears again on the Hγ line, and some FeII emission traces are also seen at the end of 1972. A sharp core due to the shell remains visible on the Hδ line.

– **HD 29866,** MWC 88; R_{1950}= 4h40.8m, D_{1950}= +40°42'; sp. t. B7IV(1), B7IV-V(2); V=6.08, B–V= +0.06, U–B=–0.28.

Observed from 1953 to 1975, this star exhibits a very slight change in emission. From 1953 to 1970, Hα is a moderate bright line, and Hβ is an absorption line. From 1971, the Hα emission line becomes stronger, and Hβ is a very weak emission line centrally superposed on the absorption feature. A shell of variable strength is nearly always visible on the Hγ line ; a sharp core is visible on the Hβ line only in 1953.

– **HD 30076,** 56 Eri, MWC 89 ; R_{1950}= 4h41.7m, D_{1950}=–8°36'; sp. t. B2V(1), B1V?(2); v sin i = 240 kms^{-1} ; V = 5.90 var, B–V=–0.11, U–B=–0.81.

Observed from 1955 to 1975, this star exhibits few changes in emission. Hα is a very strong, wide bright line, Hβ is a strong line, and Hγ is a weak emission centrally superposed on a broad absorption. The FeII lines are also bright. The emission seems to decrease in 1962, when the FeII lines are missing. The CII λ 4267 line, seen as a very faint absorption until 1962, afterwards becomes more visible.

– **HD 32343,** 11 Cam, MWC 96 ; R_{1950}= 5h01.8m, D_{1950}= +58°54' ; sp. t. B3V(1); v sin i = 130 kms^{-1} ; V=5.08, B-V=–0.08, U–B=–0.69.

Observed from 1955 to 1974, this star exhibits a strong emission in the Balmer lines. Hα is a strong bright line, and emission centrally superposed on a broad absorption line, and diminishing in intensity from Hβ to Hϵ is observed. The intensity of the emission is lowest in 1961. The FeII lines are bright and particularly clear between Hγ and λ 5300 from 1963 to 1971. From 1973, they seem to disappear (see illustration).

– **HD 32991,** 105 Tau, MWC 98 ; R_{1950}= 5h04.9m, D_{1950}= +21°38'; sp. t. B2V(1), B3.5V(2); v sin i = 220 kms^{-1} ; V = 5.89, B–V= +0.19, U–B=–0.57.

Observed from 1954 to 1974, this star exhibits few noticeable changes in emission. Hα is a very strong, wide bright line, Hβ is a strong emission centrally superposed on a broad absorption and Hγ is a weak emission on an absorption. The FeII lines are bright and hazy, quite clear until 1973, and afterwards seeming to decrease.

– **HD 33328,** λ Eri ; R_{1950}= 5h06.8m, D_{1950}=–8°49' ; sp. t. B2IV(1), B2.5III-IV(2); v sin i = 335 kms^{-1}; V = 4.27 var, B–V=–0.19, U–B=–0.90.

Observed from 1955 to 1975, this star exhibits large changes in the Hα emission line and goes through a « B star » phase to a « Be star » phase. From 1955 to 1958, Hα is a hazy absorption, and from 1959 to 1961 alternatively in emission or in weak absorption. A dark sharp core is observed on the Hβ absorption line. From 1962 to 1965, Hα is a distinct absorption, and from 1968 to 1969, is a very weak emission or not distinguished from the continuum. From 1971 to 1975, emission is clearly present on Hα but with variable intensity ; dark sharp cores are seen on the Hβ and Hγ lines (see illustration).

– **HD 33988,** 12 Aur, MWC 104 ; R_{1950}= 5h12.7 m, D_{1950}= +46°22' ; sp. t. B2V(1), B2.5III?(2); V=6.88, B–V= +0.25, U–B=–0.74.

Irregularly observed from 1955 to 1975, this star exhibits a change in emission in the Balmer lines and a temporary shell. In 1955, Hα is a rather strong bright line, Hβ is moderate and the other hydrogen lines are weak emission lines centrally superposed on broad absorptions, diminishing in intensity from Hγ to H8. Some faint FeII emission traces are also observed. From 1961 to 1968, Hβ is a fainter bright line, and on the other hydrogen lines are sharp dark cores centrally superposed on very weak, hazy broad absorptions, doubtless disturbed by the emission ; the MgII λ 4481 absorption line is quite well seen. From 1969 to 1973, the shell components disappear, and the spectral characteristics are then the same as in 1955. In 1974-1975, the emission is hardly observed on the Hβ line and a sharp dark core is again observed on the hydrogen lines. The narrow NaI and CaII lines are seen during these observations.

– **HD 35439,** 25 Ori, MWC 110; R_{1950}= 5h22.2m, D_{1950}= +1°48' ; sp. t. B1V(1), B2III-IV(2); v sin i = 315 kms^{-1} ; V=4.95, B–V=–0.20, U–B=–0.92.

Observed from 1953 to 1975, this star is sometimes in a « B star » phase, at other times in a « Be star » phase. In 1953 Hα is an absorption line. In 1954, and at the beginning of 1955, the Hα absorption is hardly seen. At the end of 1955, Hα is a weak emission line, and Hβ is then a very weak absorption line. Hα is not visible in 1956-1957, becoming a very faint emission in 1962-1963, remaining faint in 1969, but becoming moderate in 1971, when Hβ is not seen. Hα is a very weak emission at the end of 1972, hardly visible at the end of 1973, and a weak emission line at the end of 1974. In 1975 Hα is again an absorption line.

– **HD 36576,** 120 Tau, MWC 111 ; R_{1950}= 5h30.6m, D_{1950}= +18°30' ; sp.t. B2IV-V(1,2) ; v sin i = 280 kms^{-1}; V=5.69, B–V=+0.01, U–B=–0.76.

Observed from 1954 to 1975, this star exhibits changes in emission lines. In 1954, Hα is a strong bright line, while Hβ and Hγ are, respectively, a rather weak and a very weak emission line centrally superposed on a broad absorption. The FeII emission lines are very weakly present. From 1955 to 1962, the emission is weaker on the Hβ line and not visible on Hγ which is then a hazy absorption line. From 1963, Hα is a very strong bright line, Hβ also becomes brighter, and Hγ is a weak emission centrally superposed on a broad absorption. The FeII emission lines are also brighter. Sometimes a very sharp dark core, owing to a faint shell component, is observed on the photospheric Hδ line especially in 1955, 1959-1961, and 1973. The narrow NaI and CaII absorption lines are present.

– **HD 37202,** ζ Tau, MWC 115 ; R_{1950}= 5h34.7m, D_{1950}= +21°07' ; sp. t. B2III(1,2) ; v sin i = 310 kms^{-1}; V = 3.00, B–V=–0.19, U–B=–0.67; spectr. bin. P=132.9 d.

Many studies on this star have been published. ζ Tau is well known for having variations, over a cycle of several years, of the structure and the strength of the lines.

Observed from 1953 to 1976, this star exhibits a strong hydrogen and metallic shell. Hα is always a very strong, wide bright line. Hβ has a complex structure, and is always disturbed by emission ; its profile is in turn a P Cygni, symmetrical, or reversed P Cygni type. All the other hydrogen lines, and sometimes the Hβ line also exhibits a sharp dark core, due to the shell. The wings of the Hγ , Hδ lines are hazy, disturbed by the emission. The FeII lines are complex and show a variable absorption centrally superposed on a hazy emission. The HeI λ 5876 and MgII λ 4481 absorption lines are unusually strong ; the SiII lines are known to have a circumstellar origin ; and the strength of the NaI and CaII absorption lines is very variable. The wings of the CaII K line are in emission.

When the Hβ line profile is symmetrical (absorption centrally superposed on a broad emission line) after having showed a reversed P Cygni structure, the shell lines are generally strongest, as in 1964, 1969, and 1973, particularly the sharp dark cores of the hydrogen, NaI, CaII, and FeII lines.

– **HD 37490,** ω Ori, MWC 117 ; R_{1950}= 5h36.5m, D_{1950}= +04°06' ; sp.t. B3III(1,2) ; v sin i = 195 kms^{-1}; V=4.57, B–V=–0.11, U–B=–0.76.

Observed from 1955 to 1975, this star exhibits at first a « Be star » phase, then a « B star » phase (though the Hα emission line is weak) and again a « Be star » phase. From 1955 to 1961, the intensity of emission gradually becomes fainter. Hα is a narrow bright line which remains rather strong. Hβ is a weak emission line centrally superposed on a hazy absorption to 1960 ; after that the emission disappears and a sharp dark core is seen on the Hγ and Hδ photospheric lines. In 1962 and 1963, the Hα line is not distinguished from the continuum. In 1964, Hα is a weak absorption line, and Hβ , Hγ , and Hδ are absorption lines with a distinct sharp core. Observed in 1968, Hα is again not distinguished from the continuum ; it is a moderate emission line in 1969, when Hβ is a hazy absorption line. The emission is gradually enhanced, and in 1970 the Hβ line is not distinguished from the continuum. In 1971-1972, a sharp dark core appears on the Hγ line. From 1973, Hα is a rather strong bright line, Hβ is a weak emission line centrally superposed on a broad absorption line, and the sharp dark core is still visible on the Hγ line. During these observations the narrow NaI and CaII absorption lines are present.

– **HD 37657,** MWC 118; R$_{1950}$= 5h38.7m, D$_{1950}$= +43°02' ; sp. t. B3Vn(1), B3-4V(2); V=7.23, B–V=+0.04, U–B=–0.61.

Observed from 1955 to 1975, this star exhibits good changes in emission in the hydrogen lines. From 1955 to 1961, Hα is a wide, very strong bright line, Hβ is strong, and Hγ is a weak emission line centrally superposed on a broad absorption. Some FeII emission line traces are also observed. In 1963-1964, the emission on the hydrogen lines begins to decrease and the FeII emission lines are no longer visible. The emission of the Hγ line disappears in 1966, and then that of the Hβ line, at the end of 1970. From 1971 to 1975, Hα is a very weak emission line and the other lines are strong absorptions.

Very occasionally a faint hydrogen shell is observed. In 1961 and 1969, a sharp dark core is seen on the Hδ line. The narrow CaII and NaI absorption lines are present on these observations (see illustration).

– **HD 37967,** MWC 122; R$_{1950}$= 5h40.3m, D$_{1950}$= +23°11' ; sp. t.B3V(1); V=6.21, B–V=–0.06, U–B=–0.64.

Observed from 1955 to 1975, this star exhibits strong emission lines. Hα is a wide, very strong bright line, and Hβ , Hγ , and Hδ are, respectively, strong, moderate, and faint emission lines centrally superposed on broad absorptions. The FeII lines are bright. Very few variations are observed during this period. The narrow CaII and NaI absorption lines are present.

– **HD 38010,** MWC 124 ; R$_{1950}$= 5h40.6m, D$_{1950}$= +25°25' ; sp. t. B1V(1); V =6.84, B–V=+0.03, U–B=–0.72.

Observed from 1955 to 1975, this star exhibits strong emission lines. Hα is a wide, very strong bright line, Hβ is strong, and Hγ and Hδ are, respectively, moderate and weak emission lines centrally superposed on broad absorptions. The FeII lines are bright and strong. Very few variations are observed during this period. The narrow CaII and NaI lines are present.

– **HD 40978,** MWC 131 ; R$_{1950}$= 6h00.9m, D$_{1950}$=+46°35' ; sp.t. B2V(1) ; V=7.21, B–V=–0.05, U–B=–0.72.

Observed from 1955 to 1975, this star exhibits changes in intensity of the emission lines. From 1955 to 1970, the emission gradually increases in the Hα and Hβ lines. Hα is a rather strong bright line, and Hβ is seen as a weak emission centrally superposed on a broad absorption. In 1971 a slight maximum of the emission is observed; on the Hβ absorption line, the centrally superposed emission is brighter and a centrally superposed emission also appears weakly on the Hγ line. Some FeII emission line traces are also observed. From the end of 1972, the emission decreases and disappears from the Hγ line. The FeII emission lines are no longer visible.

– **HD 41335,** MWC 133 ; R$_{1950}$= 6h01.8m, D$_{1950}$=–6°42' ; sp. t. B2Vn(1), B3V?(2); v sin i = 420 kms^{-1} ; V=5.21, B–V=–0.06, U–B=–0.85; spectr. bin. P=81 d.

Observed from 1955 to 1975, this star exhibits strong emission lines. Hα is a wide, very strong bright line, Hβ is strong, and Hγ and Hδ are, respectively, moderate and weak emission lines centrally superposed on broad absorptions. A trace of emission is seen centrally on the Hϵ line. The FeII emission lines are rather strong. At this dispersion, very few spectral variations are observed.

– **HD 41511,** 17 Lep, MWC 519; R$_{1950}$= 6h02.8m, D$_{1950}$ = –16°29' ; sp. t. A2(1), A0III?(2); v sin i = 100 kms^{-1} ; V=4.93, B–V=+0.24, U–B=+0.12; spectr. bin. P=276 d.

Observed from 1955 to 1974, this star exhibits a permanent strong shell of hydrogen and metals. The FeI, CaI, FeII, TiII, CrII, ScII, and NiII lines are very clearly visible. The CaII and NaI absorption lines are very strong. Occasionally some variations of the strength of the shell lines are observed, in particular those of the TiII and CrII lines. Emission is seen only at Hα ; this line is weak and decreases from 1962 to 1974 (see illustration).

– **HD 43285,** MWC 136; R$_{1950}$= 6h13.0m, D$_{1950}$ = +6°05' ; sp. t. B5Vn(1), B6V(2); v sin i = 290 kms^{-1}; V=6.07, B–V=–0.13, U–B=–0.52.

Observed from 1954 to 1973, this star exhibits changes in emission in the first Balmer lines. To 1964, the Hα emission line is rather strong, Hβ is a weak emission line centrally superposed on a broad absorption, and Hγ presents only a very weak emission trace. In 1969, emission is visible only at Hα ; then it is weaker and decreases to 1972, after which it remains unchanged in intensity to 1973. From 1963, the MgIIλ 4481 line seems to increase, and from 1971, so do the SiII $\lambda\lambda$ 4128-4131 lines (see illustration).

– **HD 44458,** MWC 138; R_{1950} = 6h19.1m, D_{1950} = –11°45' ; sp. t. B1Vn(1,2); v sin i = 265 kms^{-1}; V=5.64, B–V=–0.02, U–B=–0.85.

Observed from 1955 to 1974, this star exhibits a gradual enhancement of the emission lines. The Hα bright line is always strong and wide. To 1963, the Hβ bright line is weak and Hγ is a very weak emission centrally superposed on a broad absorption line. Fron 1964, Hβ becomes brighter, the emission is weak but clearly seen on the Hγ line centrally, and the FeII lines are bright. The narrow CaII and NaI absorption lines are weak during this period.

– **HD 44996,** MWC 526; R_{1950} = 6h22.0m, D_{1950} = –12°56' ; sp. t. B4V(1); v sin i = 120 kms^{-1} ; V=6.12, B–V=–0.08, U–B=–0.63.

Observed from 1955 to 1974, this star exhibits slight changes in emission lines. Hα is a narrow bright line of moderate intensity to 1961, and then decreases gradually to 1974. In 1961, there seems to be a very weak emission line on the Hβ absorption line. A sharp dark core is at times seen on the Hγ absorption line, especially in 1969-1970.

– **HD 45314,** MWC 140; R_{1950}= 6h24.4m, D_{1950} = +14°55' ; sp. t. O9-B0? (1) ; V=6.64, B–V= +0.15, U–B=–0.88.

Observed irregularly from 1954 to 1975, this star exhibits great changes in emission and a temporary hydrogen shell. From 1954 to 1958, the Hα line is strong and bright, Hβ is moderate, and Hγ is a weak emission centrally superposed on a very hazy absorption. The Hδ line is a very weak absorption, and the other hydrogen lines are hazy, because of a « veiling » effect. The HeI λ 5876 line is bright. The blend of the HeI and FeII $\lambda\lambda$ 5016-5018 also shows some traces of emission. From 1963 to 1968, the emission in the hydrogen lines gradually decreases ; Hβ is faint. The Hγ line is a broad, hazy absorption, and the other hydrogen lines are distinct absorptions. From 1969 to 1972, a minimum of emission is observed. The Hα emission line is moderate, the HeI λ 5876 emission line is very weak, and the Hβ line is not distinguished from the continuum. A dark core, owing to a shell, is seen on the other hydrogen lines.

At the end of 1972, the shell has disappeared and the emission is again faintly seen on the Hβ line; Hγ is a hazy absorption line. the gradual enhancement continues from 1973 to 1975, and the Hβ and HeI λ 5876 lines are again bright and clearly visible ; then the veiling effect is noticeable in the short wavelength range. The narrow CaII and NaI absorption lines are present (see illustration).

– **HD 45542,** ν Gem ; R_{1950}= 6h26.0m, D_{1950}= + 20°15' ; sp. t. B6III(1), B6IV?(2); v sin i = 220 kms^{-1} ; V=4.15, B-V=–0.13, U–B=–0.48.

Observed from 1954 to 1975, this star exhibits at this dispersion only a few appreciable changes in emission. Hα is always a weak emission line. There seems to be a slight minimum of the emission in 1971-1972. A faint sharp dark core, due to a weak shell component, is at times visible on the Hβ absorption line, as in 1957, and in the Hγ line in 1961, 1968-1972, and 1975.

– **HD 45725,** β Mon A, MWC 143; R_{1950}= 6h26.4m, D_{1950}= –7°00' ; sp. t. B3V(1,2); v sin i = 345 kms^{-1} ; V =4.6.

Observed from 1955 to 1975, this star exhibits strong emission lines in its spectrum and a hydrogen shell. In 1955, Hα is a wide, very strong emission; Hβ and Hγ are respectively strong and weak emission lines centrally superposed on broad absorptions. The other hydrogen lines are wide absorptions with a sharp dark core due to a shell component ; however there seems to be some emission on the Hδ line ; because the wings of the photospheric component are very hazy. The FeII lines are bright. From 1960 to 1964, the hydrogen shell components become very strong, peculiarly from 1961 to 1963 ; there are seen on every hydrogen line except Hα . At the same time, the NaI and CaII absorption lines increase. The emission itself becomes stronger, especially in 1963-1964, and Hγ then exhibits a P Cygni profile while a very sharp dark core is seen on the broad and very hazy Hδ and Hϵ lines. The FeII lines become brighter. From 1969 to 1975, the emission lines as well as the shell components decrease.

– **HD 45910,** AX Mon, MWC 145; R_{1950} = 6h27.9m, D_{1950} = +5°54' ; sp. t. B2III(1) ; v sin i = 430 kms^{-1}; V = 6.77, B–V= +0.33, U–B=–0.67 ; spectr. bin. P = 232.5 d.

This star has already given rise to detailed studies, it is known to show important changes in the structure and intensity of the emission lines. A hydrogen and metallic variable shell appears cyclicly following the binary period with a maximum of strength toward 0.5 phase.

Observed from 1955 to 1973, this star exhibits an absorption and emission spectrum that varies within, and between cycles ; the Hα bright line is very strong and wide. The Hβ , Hγ , and Hδ lines often show a P Cygni profile. The FeII lines are bright, and of variable intensity.

Toward 1960, the hydrogen and metallic shell reaches its maximum strength ; the metallic lines are particularly easy to see toward 0.5 phase ; the FeII emission lines, which seem fainter, are divided by a dark core due to the metallic shell. Toward 0.75 phase, the hydrogen shell lines are always present but the metallic shell lines have disappeared ; the FeII emission lines are brighter. Toward 0 phase, none of the hydrogen shell lines are any longer seen.

During a given cycle, some changes in the MgII, NaI, CaII, and some HeI absorption lines are observed. From 1962 to 1965, the FeII emission lines are no longer as bright as in 1960, when they are comparable to the FeII lines in the very same phases of the binary period. The emission components of the hydrogen lines are weaker in 1968-1969 than in 1960. In 1972-1973, the emission has disappeared from the Hδ line and is hardly visible on Hγ . From 1968, the metallic shell is also weaker than in 1960.

– **HD 45995,** MWC 146 ; R_{1950}= 6h28.4m, D_{1950}= +11°17' ; sp. t. B2Vn(1), B2.5(2) ; v sin i = 295 kms^{-1} ;V= 6.14, B–V=–0.08, U–B=–0.86.

Observed irregularly from 1954 to 1973, this star exhibits rather strong emission lines and a temporary hydrogen shell. Hα is a strong, wide bright line, Hβ is moderate, and Hγ is a weak emission centrally superposed on a broad absorption line. The FeII lines are bright. A sharp dark core due to a shell component is often visible on the Hγ and Hδ lines, particularly from 1961 to 1965, when a slight maximum of the FeII and hydrogen lines is observed. The narrow CaIIK line is always very strong.

– **HD 47054,** MWC 150; R_{1950} = 6h34.1m, D_{1950} = –5°10' ; sp. t. B8V(1) ; v sin i = 245 kms^{-1} ;V = 5.52, B–V=–0.08, U–B=–0.39.

Observed from 1954 to 1974, this star exhibits slight changes in emission. Hα is a bright line of moderate intensity ; Hβ is seen to 1972 as a very weak emission centrally superposed on the photospheric line, and then this emission disappears. The strength of the MgII λ 4481 absorption line seems to fluctuate during these observations.

– **HD 50083,** MWC 156; R_{1950}= 6h49.1m, D_{1950}= +5°09' ; sp. t. B2IV(1); V=6.92, B–V= +0.06, U–B=–0.76.

Observed irregularly from 1955 to 1973, this star exhibits strong emission lines. The Hα line is bright, wide, and very strong ; Hβ is a strong emission centrally superposed on a broad, faint and very hazy absorption line ; Hγ is a moderate emission line on a broad absorption. Hδ is a hazy absorption line except between 1960 and 1963 at the maximum of the emission, when a weak emission appears centrally on this line. The FeII lines are weak emission lines from 1955 to 1960, becoming stronger from 1960 to 1963 and then weakening, but remaining brighter than before in 1955. The narrow CaII and NaI absorption lines are seen.

– **HD 50138,** MWC 158; R_{1950}= 6h49.1m, D_{1950}= –6°54' ; sp. t. B6III(1); V=6.67, B–V= +0.01, U–B=–0.40.

Many studies on this star have been published. HD 50138 is well known to exhibit some variations of the structure and of the strength of the spectral lines, with a period of about fifty days.

From 1954 to 1975, this star shows strong emission lines as well as a shell of variable strength. The Hα line is very strong and wide; Hβ is seen as a strong emission centrally superposed on a hazy absorption. The Hγ line is also strongly disturbed by the emission and at this dispersion shows a complex and variable structure (a P Cygni profile of the Hγ line is observed in 12/1955, 2/1959, 2/1960, 10/1960, 3/1961, 12/1962, 1/1969, and 3/1970). Hδ is also affected by emission. Dark sharp cores are seen centrally on the H lines from Hγ , sometimes from Hβ .

The FeII lines are bright and numerous, with a narrow absorption, hardly seen at this dispersion, on some lines. CaII λ 3933 also has a variable and complex structure, with emission wings at the edges of a deep central absorption. The SiII, MgII, and NaI absorption lines also seem to change. When the Hγ line exhibits a P Cygni-type profile, the FeII emission lines seem brighter. When the Hγ line profile is symmetrical, the narrow dark cores of the hydrogen lines are very deep, whereas the metallic emission lines seem weaker, probably because the central absorption is stronger.

– **HD 50658,** ψ^9 Aur, MWC 537 ; R_{1950}= 6h52.8m, D_{1950}= +46°20' ; sp. t. B8III(1) ; v sin i = 270 kms^{-1} ; V=5.8, B–V=–0.06, U–B=–0.45.

Observed from 1954 to 1975, this star is sometimes in a « B star » phase and at other times in a « Be star » phase. A temporary shell is present. In 1954, the Hα line is bright, narrow, and of moderate intensity, and Hβ is a weak, narrow emission centrally superposed on an absorption line. A faint sharp dark core is observed on the Hγ line.

At the beginning of 1955, the shell component is quite visible on the Hβ , Hγ, and Hδ photospheric lines. From the end of 1955 to 1958, Hα is not distinguished from the continuum. From 1959 to 1961, Hα is an absorption line and the other hydrogen lines are distinct absorptions. In 1961, a sharp dark core is clearly visible on the Hβ line ; the HeI, MgII, NaI, and CaII lines are enhanced. At the end of 1962, Hα is again a very moderate emission line ; the Hγ and Hδ lines have dark cores. The emission becomes stronger little by little ; in 1963, Hα is brighter, the wings of the Hβ line seem to be disturbed by emission, and the Hβ to Hϵ lines have sharp dark cores. The NaI and CaII absorption lines are always strong. During the enhancement of the emission, the strength of the shell is maximal.

In 1966, the Hα bright line is strong and Hβ is seen as a weak emission centrally superposed on a broad absorption line. The dark cores due to the shell remain visible on the Hγ and Hδ lines but disappear in 1968. At the end of 1969, the Hα emission line decreases, and the shell component is again observed on the Hβ and Hγ lines. Hα is weak at the end of 1970 and is not distinguished from the continuum in 1971, but there is still a dark core on the Hγ line. At the end of 1972, the emission reappears faintly on Hα . In 1975, this line is moderate, and a sharp dark core is again seen from Hβ to H8 ; the NaI, CaII, and MgII absorption lines are again strong.

– **HD 50820,** MWC 827 ; R_{1950}= 6h52.2m, D_{1950}= –1°42' ; sp. t. B2IV-V + F3(1), B3IV(2); v sin i = 130 kms^{-1} ;V = 6.21, B–V=+0.56, U–B=–0.35 ; bin.

This star is a binary, with the superposed spectra of an early B and F star.

Hα is a rather narrow, strong emission line, Hβ is a weak, narrow emission centrally superposed on a broad absorption line. The spectrograms, of very mediocre quality, do not give evidence of changes in emission.

– **HD 51354,** MWC 314 ; R_{1950}= 6h54.8m, D_{1950}= +17°58' ; sp. t. B3Vn(1) ; V = 7.12, B–V=–0.18, U–B=–0.65.

Observed irregularly from 1954 to 1973, this star exhibits very few changes in emission. The Hα line is bright and rather strong, and Hβ is a hazy absorption. In 1954-1955, a sharp dark core is seen on the Hγ line. From 1970, a dark core is observed on the Hβ absorption line, whose wings also seem disturbed by emission, as well as on the Hγ and Hδ lines. At the end of 1973, Hα is brighter, Hβ is not distinguished from the continuum, and there is always a sharp dark core on the Hγ line. The narrow NaI and CaII absorption lines are present but weak.

– **HD 51480,** MWC 161; R_{1950}= 6h54.8m, D_{1950} = –10°45' ; sp. t. A?(1) ; V = 6.93, B–V =+0.31, U–B=–0.58.

Observed irregularly from 1955 to 1973, this star exhibits many emission lines. The Hα line is bright, strong, and wide ; Hβ is rather strong ; and the other hydrogen lines always show a P Cygni type profile. The FeII lines are bright and strong, but the dispersion is not great enough to reveal their structure. The absorption lines of MgII λ 4481 and of HeI $\lambda\lambda$ 5016, 4922, and 4471 are strong ; the other lines are very hazy and hardly visible. In the short wavelength range (λ3850), the hydrogen lines are difficult to detected and seem to be « veiled ». The NaI and CaII absorption lines are strong.

– **HD 52721,** MWC 164 ; R_{1950}= 6h59.5m, D_{1950}= –11°14' ; sp. t. B2Vn(1) ; V = 6.59, B–V=+0.06, U–B=–0.77.

Observed from 1955 to 1975, this star exhibits very few changes in emission. The Hα line is bright and rather strong, Hβ is a weak emission centrally superposed on a broad absorption line, and Hγ shows a very weak trace of emission on a broad, hazy absorption.

– **HD 53367,** MWC 166 ; R_{1950}= 7h02.1m, D_{1950}=–10°23' ; sp. t. B0.5 : (1) ; V = 6.96, B–V=+0.44, U–B=–0.59.

Observed irregularly from 1955 to 1975, this star exhibits large changes in emission. In 1955 Hα is bright and strong, and Hβ is a weak and very hazy absorption ; a sharp dark core, displaced towards the short wavelengths, is seen on the Hγ photospheric line. In 1961 and 1968, Hβ is not distinguished from the continuum ; this line is bright but very weak in 1969 and disappears in 1970. Hβ is dark in 1971, and the other higher Balmer lines are very strong absorptions. At the end of 1972, Hβ is again not seen. At the end of 1973, it is a rather strong emission line again, decreasing in 1975. Some weak FeII emission line traces are also seen in 1973.

– **HD 53416;** R_{1950}= 7h02.7m, D_{1950} = +14°33' ; sp. t. B8IV(1), B9V(2); V = 6.8.

Observed from 1955 to 1974, this star exhibits no spectral changes. $H\alpha$ is always a narrow emission line of moderate intensity and $H\beta$ is a weak emission centrally superposed on an absorption line.

HD 53974 ; R_{1950}= 7h04.3m, D_{1950}= –11°13' ; sp. t. B0.5III(1) ; v sin i = 155 kms^{-1} ; V = 5.39, B–V= +0.05, U–B= –0.85; bin.

This star is not generally considered as an emission line star. However, on the spectra, recorded from 1955 to 1975, the $H\alpha$ absorption line exhibits some noticeable fluctuations. In 1955, $H\alpha$ is a very diffuse and hardly visible absorption ; from 1961 to 1965, this absorption line is sharp and conspicuous, and in 1972-1975 it is again hazy.

– **HD 58050,** MWC 176; R_{1950}= 7h21.6m, D_{1950} = +15°37' ; sp. t. B2V(1); v sin i = 140 kms^{-1}; V = 6.41, B–V= –0.18, U–B= –0.84.

Observed from 1954 to 1975, this star exhibits strong emission lines. The bright $H\alpha$ line is generally wide and very strong. $H\beta$ to H8 are narrow bright lines of diminishing intensity, centrally superposed on broad absorptions. The FeII lines are bright. For all these lines, emission is slightly enhanced from 1954 to 1960, and is maximal from 1961 to 1962. In 1963-1964, the emission lines are slightly less intense. A minimum of emission is observed in 1968. The $H\alpha$ bright line remains rather strong, $H\beta$ is a weak emission on a broad absorption line, and $H\gamma$ and $H\delta$ are broad, very hazy absorption lines whose cores are each disturbed by a very weak emission. The FeII lines, which are in strongest emission in 1960, decrease afterwards and disappear after 1963.

From 1969 to 1970, emission again increases in the Balmer lines and it is seen at $H\epsilon$, but without reaching the intensity of 1955-1960 because there are no FeII emission lines. The emission decreases again in 1971-1972 and is not longer visible on the $H\epsilon$ line, disappears from he $H\delta$ line at the end of 1973 and in 1974, and strengthens again in 1975, when it is seen once more on the $H\delta$ line.

– **HD 58343,** MWC 177; R_{1950}= 7h22.4m, D_{1950}= – 16°06' ; sp.t. B3IV(1) ; v sin i = 35 kms^{-1} ; V=5.33, B–V= –0.05, U–B= –0.60.

Observed irregularly from 1955 to 1973, this star exhibits few changes in emission. The $H\alpha$ line is bright and strong. $H\beta$, $H\gamma$, and $H\delta$ are, respectively, moderate, weak, and very weak emissions each centrally superposed on broad absorptions, except at the end of 1964 and in 1970, when the emission is minimal (no observations between these two epochs). From 1971 to 1973, the emission gradually increases, reappearing centrally on the $H\delta$ line at the end of 1972.

– **HD 58715,** β CMi, MWC 178 ; R_{1950}= 7h24.4m, D_{1950}= +8°24'; sp. t. B8Vn(1), B7III?(2); v sin i = 275 kms^{-1} ; V = 2.90, B–V = –0.09, U–B= –0.28.

Observed from 1955 to 1974, this star exhibits few changes in emission. $H\alpha$ is a narrow bright line of moderate intensity, and the other hydrogen lines are in absorption.

– **HD 60855,** MWC 565; R_{1950}= 7h33.8m, D_{1950} = –14°23' ; sp. t. B2Vn(1,2); v sin i = 285 kms^{-1} ; V=5.70, B–V= –0.12, U–B= –0.71.

Very irregularly observed from 1954 to 1961 and from 1970 to 1974, this star exhibits a « Be star » phase from 1954 to 1961 and a « B star » phase from 1970 to 1974. In 1954, $H\alpha$ is an emission line of moderate intensity, $H\beta$ is not distinguished from the continuum, and $H\gamma$ is a sharp dark core on a very weak, hazy absorption. Later, the emission decreases. At the end of the 1960, the emission is still present at $H\alpha$, while the $H\beta$ and $H\gamma$ lines show a sharp dark core on a very weak, broad, hazy photospheric line. On resumption of the observations in 1970, $H\alpha$ is a weak absorption line and the other hydrogen lines are deeper absorptions. At the end of 1974, the $H\alpha$ emission line is hardly distinguished from the continuum and the other Balmer lines are less distinct absorptions.

– **HD 61224,** MWC 849 ; R_{1950}= 7h25.4m, D_{1950}= –14°20' ; sp. t. B9III(1) ; v sin i = 275 kms^{-1}; V = 6,53, B–V= –0.01, U–B= –0.30.

Irregularly observed from 1957 to 1975, this star exhibits no noticeable spectral variations on the spectrograms. $H\alpha$ is a narrow, moderately intense emission line ; the other spectral lines are dark.

– **HD 62367**, MWC 567; R_{1950}= 7h41.1m, D_{1950}= –4°34' ; sp. t. B6III(1); V = 7.14, B–V=–0.08, U–B=–0.43.

Observed from 1960 to 1975, this star exhibits few changes in emission. Hα is a narrow, strong emission line, Hβ and Hγ are narrow emission lines of moderate and very weak intensity, respectively each centrally superposed on a broad absorption.

– **HD 65875**, MWC 190; R_{1950}= 7h58.2m, D_{1950}=–2°45' ; sp. t. B2Vn(1), B1V(2); v sin i = 150 kms^{-1} ; V=6.51, B–V=–0.07, U–B=–0.81.

Observed from 1955 to 1975, this star exhibits strong emission lines. Hα is a very wide, very strong emission line ; Hβ , Hγ , and Hδ are strong, moderate, and weak emission lines, respectively, each centrally superposed on a hazy absorption. Hϵ is a hazy absorption, except in 1968, when a very weak trace of emission is observed centrally on this line ; there is a slight maximum of the emission at this epoch. the FeII lines are always bright and strong.

– **HD 71072**, MWC 857; R_{1950}= 8h22.7m, D_{1950}= –12°36' ; sp. t. B7IV-V(1); V=6.9.

Observed irregularly from 1960 to 1974, this star has no emission lines.

– **HD 89884**, MWC 582; R_{1950}= 10h19.6m, D_{1950} = –17°47'; sp. t. B6V(1); v sin i = 300 kms^{-1} ; V = 7.13, B–V=–0.11, U–B=–0.56.

Observed irregularly from 1954 to 1962 and from 1970 to 1973, this star exhibits no appreciable changes in emission on the spectrograms. The Hα line is bright and strong, Hβ is a rather weak emission line centrally superposed on a broad absorption. A sharp dark core is seen on the photospheric Hγ line in 1954-1958 and in 1960-1961.

– **HD 91120**, MWC 205 ; R_{1950}= 10h28.5m, D_{1950}= –13°20' ; sp. t. B9Vn(1) ; v sin i = 330 kms^{-1}; V = 5.6, B–V=–0.04, U–B=–0.15.

Observed irregularly from 1954 to 1963 and from 1970 to 1975, this star exhibits a slight variation of the emission. In 1954 Hα is a weak emission which gradually increases to moderate intensity by 1961. At this epoch, a faint sharp dark core is seen in turn on the Hβ and Hγ photospheric lines. Then Hα decreases in intensity until 1975, when its strength is similar to that observed in 1957.

– **HD 109387**, κ Dra, MWC 222; R_{1950}= 12h31.4m, D_{1950}= +70°04' ; sp. t. B5IV(1); v sin i = 250 kms^{-1} ; V = 3.87, B–V=–0.13, U–B=–0.57.

Observed from 1954 to 1975, this star exhibits rather strong emission lines. The Hα emission line is very strong and very wide, Hβ is a moderate emission line centrally superposed on a broad absorption, and the wings of the Hγ absorption line seem to be disturbed by emission. The FeII lines are bright, wide, hazy, and are particularly visible between the Hα and Hβ lines. The emission intensity is at a maximum in 1962-1963. A sharp dark core due to a shell component is temporarily observed on the Hγ and Hδ lines (in 1954-1955 on the Hδ line, in 1961, 1966, 1967, and 1970 on both, in 1972 on Hδ , in 1974 on Hγ , and in 1975 on both). These sharp cores seem to change very quickly, within several days. The MgII λ 4481 absorption line also changes very quickly : sometimes it is as strong as HeI λ 4471 and sometimes it is hardly visible.

– **HD 138749**, θ CRB, MWC 237 ; R_{1950}= 15h30.9m, D_{1950}= +31°32' ; sp. t. B6Vn(1), B6V-IV(2); v sin i = 400 kms^{-1}; V = 4.14, B–V=–0.13, U–B=–0.54.

Observed regularly from 1953 to 1975 this star exhibits no emission lines on the spectrograms.

– **HD 141569**, MWC 238; R_{1950}= 15h47.3m, D_{1950} = –3°46'; sp. t. A0V(1), A1V?(2); V=6.9.

Observed from 1955 to 1975, this star exhibits no changes in emission. Hα is always a moderately strong emission line centrally superposed on a broad absorption ; the other hydrogen lines are very broad absorptions.

– **HD 142926**, 4 Her, MWC 584; R_{1950}= 15h53.8m, D_{1950}= + 42°43' ; sp. t. B7(1), B8V(2) ; v sin i = 350 kms^{-1} ; V = 5.75, B–V=–0.11, U–B=–0.41 ; spectr. bin. P=46.0 d.

Observed from 1953 to 1975, this star exhibits a « B star » phase from 1953 to 1962, and then a « Be star » phase with a shell. From 1953 to 1962, the Hα line is dark ; the NaI absorption lines are of variable strengths, appearing very clearly between 1957 and 1961. In 1963, the Hα line is no longer visible. In 1964 it is a rather strong emission line ; at the same time a hydrogen and metallic (FeII, SiII, TiII) shell is observed. NaI, CaII, MgII and SiII $\lambda\lambda$ 4128-4131 lines are enhanced after 1962, just before the appearance of emission on the Hα line (see illustration).

–**HD 142983,** 48 Lib, MWC 239; R_{1950}= 15h55.4m, D_{1950}=–14°08' ; sp. t. B3III(1), B2.5III?(2); v sin i = 395 kms^{-1} ; V = 4.88 var, B–V=–0.10, U–B=–0.20.

Many studies of this variable shell star have been published. Observed from 1953 to 1975, HD 142983 exhibits great changes in the shell lines. Hα is a very strong, very broad emission line. The Hβ line, which is disturbed by emission, has a complex and variable profile. The wings of the Hγ line, although scarcely visible, are probably disturbed by emission. When the strength of the shell lines increases, the Hβ line has a « reversed P Cygni » profile, and when it decreases, the Hβ line has a « P Cygni profile ». The FeII, TiII, CrII, NiII, and SiII shell lines are always present but are of variable strength. During these observations, the shell lines are particularly strong from 1953 to 1955, 1959 to 1967, and 1974 to 1975, but are strongest in 1962-1964. The strengths of MgII λ 4481 and of the shell lines mentioned increase at the same time. The CaII and NaI absorption lines are particularly strong and have a circumstellar origin (see illustration).

– **HD 148184,** χ Oph, MWC 241; R_{1950}= 16h24.1m, D_{1950}=–18°21'; sp. t. B1.5V(1), B1.5V(2); v sin i = 135 kms^{-1} ; V = 4.42 var, B–V=+0.28, U–B=–0.75.

Observed from 1953 to 1975, this star exhibits very strong emission lines. From 1953 to 1969, the Hα line is bright, very strong, and wide ; Hβ is strong, and Hγ a moderately intense emission on a broad absorption line. A « veiling » effect is observed in the short-wavelength range. The Hδ and Hϵ lines are hazy and hardly distinguished from the continuum. showing a weak emission line on a broad absorption line. The H8 line is not seen. The FeII lines are strong and bright. From 1970 to 1973, the « veiling » effect diminishes and the Hδ and Hϵ lines are better defined ; the HeI lines seem to be in deeper absorption, while the FeII emission lines decrease in intensity. In 1974 and 1975, the Hδ and Hϵ lines are clearly visible and still show a weak emission on a broad absorption, but the intensity of emission in the FeII lines has decreased greatly ; they are hardly visible in 1975.

– **HD 162428,** MWC 594 ; R_{1950}= 17h48.0m, D_{1950}=+24°29' ; sp. t. B7Vn(1), B7V(2) ; v sin i = 350 kms^{-1}; V = 7.0.

Observed from 1954 to 1975, this star has changes in the emission lines and a shell of variable strength. The spectrogram obtained in 1954 does not show the Hα line ; at that time the Hβ , Hγ and Hδ absorption lines, whose wings are particularly hazy, show a sharp dark core due to a shell component ; there are also some FeII absorption lines.

From 1956 to 1964, Hα is bright and strong, and Hβ is a weak emission centrally superposed on a broad absorption line. The strength of the emission is maximal in 1962-1963. The shell observed in 1954 is much weaker in 1956, and the FeII lines disappear ; only a variable sharp dark core remains visible on the Hγ and sometimes Hδ lines. In 1965, when the emission begins to decrease, the narrow shell component, centrally superposed on the Hγ photospheric line, is notably strengthened. In 1966, a sharp dark core also appears on the Hβ line, whose wings are then very diffuse. In 1967, the shell component is visible on the Hδ line. In 1968, the hydrogen lines from Hβ to H8 exhibit a very distinct sharp dark core ; the Hα emission line is weaker then. From 1969, the strength of the hydrogen shell decreases, and a sharp dark core is seen only on the Hγ line. Hα is bright and strong and there is again a central emission on the photospheric Hβ line. In 1974, any trace of the shell seems to have disappeared, but in 1975 it is again visible on the Hγ and Hδ lines.

During these observations, the NaI and CaII absorption lines vary and seem deeper when the shell is present (see illustration).

– **HD 162732,** 88 Her ; R_{1950}= 17h48.8m, D_{1950}= +48°24' ; sp. t. B7(1), B6V?(2) ; v sin i = 300 kms^{-1}; V = 6.68, B–V=–0.11, U–B=–0.41 ; spectr. bin. P=86.6 d.

Observed from 1955 to 1975, this star exhibits a « Be star » phase with a shell and then a « B star » phase. From 1955 to 1960, Hα is bright and strong, the Hβ wings are very hazy and disturbed by emission, and there is a hydrogen and metallic (FeII, TiII, CrII, NaI, CaII) shell. The Hα emission line gradually weakens from 1961 to 1971 ; the metallic shell lines very weak from 1966, disappear in 1969 a little before the disappearance, in 1971, of the emission on the Hα line. In 1972 and 1973, Hα is a weak absorption, and the NaI and CaII absorption lines, which remained strong to 1971, have decreased in strength. In 1974-1975, the Hα absorption line is deeper ; the hydrogen shell disappears in 1973, but seems to be present again in 1975 (see illustration).

– **HD 164284,** 66 Oph, MWC 278 ; R$_{1950}$= 17h57.8m, D$_{1950}$=+4°22' ; sp.t. B2Vn(1) ; v sin i = 220 kms^{-1}; V = 4.64 var, B–V=–0.03, U–B=–0.83.

Observed from 1953 to 1976, this star has large changes in emission and a temporary hydrogen shell. In 1953 and 1954, Hα is a moderately strong emission, Hβ is a very hazy absorption, and the Hγ line sometimes has a sharp dark core on the photospheric component. In 1955, the Hα line is dark and weak ; at that epoch, a « B star » phase is observed for a very short time. In 1956, Hα is again an emission line but a weak one, and Hβ is an absorption line. Then the emission gradually increases in the spectrum and in 1958, the Hα emission line is moderate, the Hβ line is a barely visible absorption line, and there is a sharp dark core on the Hγ absorption line. In 1959, Hβ is an emission centrally superposed on a broad absorption line. A weak shell component is visible centrally on the Hγ and Hδ lines, and traces of FeII emission lines are visible. In 1960, the Hγ line shows a hazy absorption, and a sharp dark core is still visible on the Hδ line. From 1961 to 1976, the emission gradually becomes stronger : the Hα bright line is strong ; Hβ is a moderate and then (after 1963) a strong emission centrally superposed on a broad absorption line ; from 1963 emission is seen centrally on the Hγ line ; and the FeII emission lines also increase. Hδ has a sharp dark core until 1969 and afterwards becomes very hazy.

– **HD 164447,** MWC 279 ; R$_{1950}$= 17h58.3m, D$_{1950}$ =+19°30' ; sp. t. B8Vn(1), B81V(2) ; v sin i = 250 kms^{-1}; V = 6.4, B–V=–0.06, U–B=–0.39.

Observed from 1953 to 1975, this star exhibits a « Be star » and then a « B star » phase. In 1953-1954, Hα is a very weak emission line, becoming from 1955 a very weak absorption which gets deeper in 1959 and then does not change to 1975. During these observations, the NaI and CaII absorption lines seem to vary.

– **HD 168797,** MWC 601 ; R$_{1950}$= 18h19.0m, D$_{1950}$= +5°25' ; sp. t. B3Vn(1) ; v sin i = 300 kms^{-1} ; V = 6.13, B–V=–0.04, U–B=–0.62.

Observed from 1953 to 1975, this star exhibits a « B star », then a « Be star », and then a « B star » phase again. A hydrogen shell is temporarily present during the « Be star » phase. In 1953, the Hα line is a weak absorption, which is moderate in 1954 and becomes deeper in 1955. The Hα line is no longer seen in 1957, is again a moderate absorption in 1958-1959, and becomes hazy in 1960. In March 1961, Hα is a very weak emission which becomes clearly visible over several months and continues to strengthen until the beginning of 1963. The wings of Hβ and Hγ , doubtless disturbed by emission, become very hazy. When the star passes from the « B star » to the « Be star » phase, and during the latter, a shell is present, and sharp dark cores are seen on the Hγ and Hδ absorption lines. The Hα line is a weak emission in 1964, a weak absorption in 1965, and again a weak emission in 1966-1967. From 1968, a « B star » phase appears : the Hα line is a marked absorption, and the other hydrogen lines are deep absorptions. During these observations, the MgII, NaI, CaII, and HeI λ 5876 absorption lines seem to vary.

– **HD 168957,** MWC 292 ; R$_{1950}$= 18h19.4m, D$_{1950}$= +25°02' ; sp. t. B3V(1) ; v sin i = 100 kms^{-1} ; V = 7.01, B–V=–0.10, U–B=–0.56.

Observed from 1955 to 1975, this star exhibits a very short « Be star » phase followed by a « B star » phase. In 1955-1956, Hα is a rather weak emission line ; in 1957, it is at first not distinguished from the continuum but then appears as a weak absorption.

From 1959 to 1969, the Hα line is a strong absorption, which afterwards seems to become fainter. During these observations, the strengths of the Hβ , Hγ , and SiII absorption lines seem to vary. The narrow NaI and CaII absorption lines are seen. The variation of the SiII absorption lines makes it difficult to classify this star.

– **HD 169033,** MWC 602 ; R$_{1950}$= 18h20.4 m, D$_{1950}$= –12°02' ; sp. t. B8IV(1) ; v sin i = 250 kms^{-1} ; V = 5.7, B–V=+0.01, U–B=–0.25.

Observed from 1954 to 1975, this star exhibits a very slight change in emission. Hα is a rather weak and narrow emission centrally superposed on a very hazy absorption line ; a weak trace of emission is also observed centrally on the Hβ photospheric line from 1959 to 1961. The emission on the Hα line becomes fainter from 1966, is hardly observed in 1971, and is still very weak in 1974-1975.

– **HD 171406** ; R$_{1950}$= 18h31.5m, D$_{1950}$= +30°51' ; sp. t. B5V(1), B5-6V(2) ; V = 6.59, B–V=–0.12, U–B=–0.51.

Observed from 1956 to 1975, this star goes through « Be star » and « B star » phases several times. In 1956, Hα is a moderately strong emission line ; in 1958-1959, it is an absorption line of variable strength, becoming fainter in 1960. In 1961, it is a weak emission centrally superposed on a broad absorption line ; this emission increases at the end of 1961, is moderately strong in May 1962, and then decreases again in 1963, At the end of 1963, the Hα line is not distinguished from the continuum or is a very weak absorption. In 1964, it is a distinct absorption ; it is much fainter in 1967. It is a hazy absorption in 1972-1974 ; an emission, of weak intensity, appears again on this line at the end of 1974 and increases in 1975. During the « Be star » phase, a rather faint sharp dark core is usually observed on the Hβ and Hγ lines, and at the same time MgII λ 4481 seems to vary. The narrow NaI and CaII absorption lines are weakly seen during these observations (see illustration).

– **HD 171780,** MWC 604 ; R_{1950}= 18h33.4m, D_{1950}= +34°25' ; sp. t. B6V(1), B7V(2) ; v sin i = 310 kms^{-1}; V = 6.10, B–V = –0.11, U–B = –0.55.

Observed from 1954 to 1976, this star goes through « B star » and « Be star » phases several times. In 1954, the Hα line is dark, but it becomes bright and strong from 1955. In 1957, Hβ is a weak emission centrally superposed on the photospheric component. In 1959-1960, Hα gradually becomes fainter, and a sharp dark core due to a shell component appears on the Hβ and Hγ lines. At the beginning of 1961, Hα is a weak and variable emission on a broad absorption ; the emission increases in intensity at the end of this year and in 1962, to decrease again in 1963, when it is hardly visible on the center of a broad absorption. From 1965 to 1968, Hα is a distinct absorption line ; in 1969-1970, it is again a moderate emission line ; in 1972, it becomes fainter. In 1973-1974, Hα is a weak emission on a broad absorption, and in 1975-1976, it is a hazy absorption. Sometimes a sharp dark core is observed on the Hβ line in 1961 and 1967 as well as on the Hγ line in 1970. The MgII absorption line and some HeI lines seem to vary (see illustration).

– **HD 173371,** MWC 956 ; R_{1950}= 18h42.4m, D_{1950}= –0°26' ; sp.t. B8III(1) ; v sin i = 310 kms^{-1}; V = 6.8.

Observed from 1955 to 1975, this star exhibits changes in the Hα line. Hα is a rather strong emission line from 1955 to 1960 ; it is weaker but remains a clearly visible emission line from 1961 to 1965, when a sharp dark core is also seen on the Hβ photospheric line. From 1967 to 1975. Hα is a weak emission centrally superposed on a broad, hazy absorption line.

– **HD 174105,** MWC 305 ; R_{1950}= 18h46.1m, D_{1950}= +15°20' ; sp. t. B7V:(1) ; v sin i = 250 kms^{-1} ; V = 6.9.

Observed from 1953 to 1975, this star exhibits slight changes in emission. From 1953 to 1969, Hα is a rather strong emission line. From 1956 to 1969, Hβ is a weak emission centrally superposed on a photospheric component. After 1969, the Hα emission line is weaker, and on emission is seen on Hβ . Sometimes a weak sharp dark core is observed on the Hγ absorption line, especially in 1959 and in 1964-1965. The NaI and CaII absorption lines are weak throughout these observations.

– **HD 174237,** MWC 608 ; R_{1950}= 18h45.6m, D_{1950}= +52°56' ; sp. t. B3 : (1) ; v sin i = 170 kms^{-1} ; V = 5.88, B–V = –0.09, U–B = –0.73.

Observed from 1953 to 1976, with some rather long observational sequences between 1957 and 1963, this star exhibits great instability of the Hα emission line. When the observations are plentiful over a long enough period, the « B star » and « Be star » phases are seen to follow one another within several days, especially between 16 and 28 September 1958, 19 and 28 April 1959, 6 and 13 July 1959, 7 and 10 October 1960, 2 and 10 March 1961, 20 and 30 May 1962, and 17 and 29 October 1963. Every time that emission appears on Hα , a sharp dark core due to a shell is observed on the Hβ and Hγ diffuse photospheric lines. Sometimes Hβ seems to be disturbed by emission because only the sharp dark component is visible, especially in September 1957, April 1959 (at the beginning and at the end of the « Be star » phase), in October 1961, October 1963 throughout the « Be star » phase, in June 1971, June 1972, and September 1974. The strength of the MgII λ 4481 absorption line varies throughout these observations, without having any apparent connection with the fluctuations in the emission.

– **HD 175511,** MWC 959 ; R_{1950}= 18h51.3m, D_{1950}= + 59°36' ; sp.t. B9.5V(1), B9V(2) ; V = 6.7.

Observed from 1956 to 1975, this star shows few spectral variations. The Hα line is always a weak emission of fluctuating intensity centrally superposed on a broad absorption line. In 1958-1959, the Hα emission line is especially weak, and there is a sharp dark core on the Hβ line. In 1960-1961, the emission strenghens, and in 1961-1962 there is again a sharp dark core on the Hβ absorption line. Then the emission weakens slightly and gradually until 1970, remaining very weak from then to 1975.

– **HD 175863,** MWC 308; R_{1950}= 18h53.1m, D_{1950}= +59°57' ; sp. t. B4V(1) ; V = 7.06, B–V = –0.14, U–B = –0.52.

Observed from 1953 to 1975, this star goes from a « B star » to a « Be star » phase. From 1953 to June 1956, the hydrogen lines are strong absorptions ; in 1958 and at the beginning of 1959, the Hα line is a hazy absorption. (On other plates, taken with a grating spectrograph (100 A/mm), the Hα line is shown in May and July 1959 as a narrow, strong absorption ; strengthenings of the NaI and the HeI λ 5876 absorption lines are also seen, as is the presence of the SiII $\lambda\lambda$ 6347-6371 absorption lines.) In 1960, the Hα line is not distinguished from the continuum, Hβ is a hazy absorption, and the Hγ absorption line is also less strong.

In 1961, emission appears weakly on Hα and gradually increases. In 1962, Hβ is a weak emission centrally superposed on the photospheric component. In 1963, Hα is bright and strong, and a very weak emission appears centrally on the Hγ absorption line. During this strengthening, very sharp dark cores are observed, on both the Hγ and Hδ absorption lines in 1962, and on the Hδ line alone in 1963. From 1962, some weak traces of FeII emission lines are seen. The emission lines are at their strongest in 1966. In 1968, a sharp dark core is again seen on the Hδ absorption line. The FeII emission lines disappear in 1970. Then the emission on the hydrogen lines becomes fainter : it is no longer visible on Hγ at the end of 1971, disappears from Hβ in 1973, and is narrow and weak on Hα in 1975. A sharp core, due to a shell component is clearly seen on the Hβ , Hγ , and Hδ photospheric lines. During these observations, the narrow NaI and CaII absorption lines are present.

– **HD 175869,** 64 Ser ; R_{1950}= 18h54.8m, D_{1950}= +2°28'; sp. t. B8III(1), B8IV(2); v sin i = 105 kms^{-1}; V = 5.57, B–V= 0.00, U–B=–0.27.

Observed from 1953 to 1975, this star exhibits slight changes in the Hα emission line. From 1953 to 1972, Hα is a weak emission centrally superposed on an absorption line. After 1973 it becomes a hazy absorption line.

– **HD 177648,** MWC 310 ; R_{1950}= 19h02.5m, D_{1950}= +23°15' ; sp. t. B2V(1); V = 7.24, B–V = +0.12, U–B=–0.51.

Observed from 1953 to 1975, this star exhibits a « Be star » phase followed by a « B star » phase. In 1953, the Hα line is bright and strong, and Hβ is a weak emission centrally superposed on a broad absorption. The Hγ line shows some traces of emission. A sharp dark core is observed on the Hδ photospheric line.

Then in 1955, the emission decreases slightly and then disappears from the Hγ line. In 1956, the Hα emission line is moderate, and Hβ shows only a very weak trace of emission centrally superposed on the absorption. In 1957, Hα is not distinguished from the continuum, the other hydrogen lines are dark, and Hβ and Hγ seem narrower.

From 1959 to 1961, Hα is a weak absorption line, becoming a weak emission again in 1962 ; a sharp dark core due to a shell component is seen on the Hβ, Hγ , and Hδ photospheric lines.

In 1963 and 1964, the bright Hα line is strong, and the wings of the Hβ line are also disturbed by emission, sharp dark cores are visible on the Hβ , Hγ and Hδ lines. In 1966 Hα becomes weaker, and then the line is no longer visible ; the sharp dark cores have also disappeared.

From 1971, Hα is again a weak emission line, and sharp dark cores are observed on the Hβ and Hγ lines. From 1973 to 1975, the Hα emission line is strong, and a dark core is still visible on the Hγ absorption line.

During these observations, the narrow CaII and NaI absorption lines are present, furthermore the MgII λ4481 absorption line seems to vary.

– **HD 178175,** MWC 311 ; R_{1950}= 19h05.3m, D_{1950}= –19°22' ; sp. t. B2V(1,2) ; v sin i = 175 kms^{-1}; V = 5.54, B–V =–0.11, U–B=–0.78.

Observed very irregularly from 1955 to 1975, this star exhibits some changes in emission. From 1955 to 1960, the Hα line is bright and of moderate intensity, Hβ is a very weak emission centrally superposed on a broad absorption, and the Hγ line is a hazy absorption. In 1964, Hα is bright but weak, and Hβ and Hγ are narrow, deep absorption lines. In 1970 and 1971, the emission increases and is weakly present on the center of the Hβ line. In 1972, Hα is not distinguished from the continuum, and Hβ and Hγ are again narrow, deep absorption lines. In 1974, emission is again seen on Hα , and Hβ is a hazy absorption. In 1975, the emission disappears from the Hα line, which is not distinguished from the continuum.

– **HD 179343,** MWC 978 ; R_{1950}= 19h09.5m, D_{1950}= +2°32' ; sp. t. B9V(1) ; v sin i = 350 kms^{-1}; V = 6.92, B–V= +0.11, U–B=–0.19.

Observed from 1953 to 1975, this star exhibits a hydrogen and metallic shell, and few changes are seen during this period. The Hα line is bright and strong, while the other hydrogen lines each have a sharp dark core on the photospheric components. The wings of the Hβ line seem to be disturbed by emission. The NaI and CaII absorption lines are strong ; FeII, CrII, and MgII are rather marked absorptions, while the SiII lines are weaker.

– **HD 183362,** MWC 318 ; R_{1950}= 19h25.9m, D_{1950}= +37°50' ; sp. t. B2Vn(1), B3V(2) ; v sin i = 245 kms^{-1}; V = 6.34, B–V=–0.14, U–B=–0.74.

Observed from 1953 to 1976, this star exhibits a slight increasing in the strength of the emission lines. In 1953, the Hα line is bright and strong, and Hβ is a weak emission centrally superposed on a broad absorption. The Hγ line is a broad hazy absorption. The emission gradually increases and from 1959 some traces of FeII emission lines are also seen. In 1961-1962, Hβ is brighter ; sharp dark cores due to a shell are seen on the Hγ and Hδ absorption lines from 1960 to 1965 ; then emission appears weakly on the Hγ line and a faint dark core is still observed on this line from 1967 to 1974. The FeII lines are brighter from 1963 to 1975. In 1975-1976, the hydrogen shell seems to have disappeared. Weak CaII absorption lines are present.

– **HD 183656,** V923 Aql, MWC 988 ; R_{1950}= 19h28.1m, D_{1950}=+3°20' ; sp. t. B8(1) ; v sin i = 180 kms^{-1}; V = 6.05, B–V= +0.01, U–B=–0.37.

Observed from 1953 to 1972, this star exhibits a strong hydrogen and metallic shell. The Hα line is bright and strong, and the other hydrogen lines show a narrow, deep dark core on the photospheric components ; the wings of the Hβ line seem to be disturbed by emission. The NaI, CaII and FeII lines are markedly stronger than the SiII lines.

– **HD 183914,** β Cyg, MWC 618 ; R_{1950}= 19h28.7m, D_{1950}= +27°52' ; sp. t. B8V(1), B9V(2) ; v sin i = 250 kms^{-1}; V = 5.11, B–V=–0.10, U–B=–0.32.

Observed from 1955 to 1975, this star exhibits few changes in emission. Hα is a narrow, moderately strong bright line, and the other hydrogen lines are dark. From 1969, the intensity of the Hα emission line seems to decrease.

– **HD 184279,** MWC 319 ; R_{1950}= 19h31.1m, D_{1950}= +3°39' ; sp. t. B0.5(1) ; v sin i = 230 kms^{-1}; V = 6.94, B–V=+0.03, U–B=–0.78.

Observed from 1953 to 1976, this star exhibits a « B star » phase followed by a « Be star » phase, along with a temporary shell of hydrogen, neutral helium, and twice ionized iron.

Hα is a very weak absorption line in 1953 and is a deeper absorption line in 1956, 1957, and 1960. It is hardly distinguished from the continuum in 1963, 1964-1966, 1969, and 1970. From 1973, emission appears strongly on the Hα line ; a hydrogen, HeI, and FeIII shell accompanies it. The HeI $\lambda\lambda$ 5876, 5016, 4922, 4713, 4471, and 3965 absorption lines are particularly strong, and FeIII lines are present. In 1975, the strength of this shell is at a maximum, and Hβ and Hγ exhibit a « reversed P Cygni » profile. In 1976, the Hα emission line gradually decreases, the strength of the shell lines decreases, and the FeIII lines have disappeared. The NaI and CaII absorption lines are always strong during these observations (see illustration).

– **HD 185037,** 11 Cyg, MWC 619 ; R_{1950}= 19h34.0m, D_{1950}= +36°50' ; sp. t. B8Vn(1), B7V(2) ; v sin i = 400 kms^{-1}; V = 5.8, B–V=–0.11, U–B=–0.37.

Observed from 1953 to 1975, this star exhibits few changes in the intensity of emission. Hα is a moderately strong emission line. From 1964 to 1966, and from 1970 to 1972, a sharp dark core is seen on the Hγ photospheric line.

– **HD 187567,** MWC 322 ; R_{1950}= 19h47.9m, D_{1950}= + 7°46' ; sp. t. B2IV(1), B3(2) ; V = 6.51 var, B–V=–0.10, U–B=–0.70.

Observed from 1953 to 1975, this star exhibits large changes in the intensity of the emission in the Balmer lines. From 1953 to 1956, the Hα line is bright and strong, and the Hβ line is a weak, hazy absorption. From 1957 to 1958, the emission strengthens on Hα and it is weakly present centrally superposed on the broad, very hazy Hβ absorption. Then the emission fades, showing a minimum of intensity on the Hα line in 1960 and 1961 ; the Hβ line has then become a deep absorption. In 1963-1964, the emission again strengthens ; it is moderate on Hα , and Hβ is a hazy absorption. In 1968, Hβ is an emission centrally superposed on a hazy absorption. Then in 1970 Hα is a strong, broad emission while the FeII lines are hazy ones. In 1975, very weak emission is seen on the center of the Hγ line.

During the increases in emission from 1955 to 1958 and from 1966 to 1970, as well as during the minimum of the intensity of the emission in 1960, a sharp dark core is observed on the Hγ photospheric line. During these observations, the narrow CaII and NaI absorption lines are seen.

– **HD 187811,** 12 Vul, MWC 323 ; R_{1950}= 19h48.9m, D_{1950}= +22°29' ; sp. t. B2V(1) ; v sin i = 280 kms^{-1} ; V = 4.95, B–V=–0.14, U–B=–0.68.

Observed from 1953 to 1975, this star exhibits « Be star » and « B star » phases alternately.

From 1953 to the end of 1957, Hα is a moderately strong emission line ; sharp dark cores are seen on the Hβ and Hγ lines, whose hazy absorption is disturbed by emission ; a dark core is also seen on the photospheric Hδ line.

In 1958, the Hα emission line decreases in intensity, and the Hβ and Hγ lines are deeper absorptions. In 1959 and 1960, Hα shows a very hazy absorption, which becomes deeper but varies from 1961 to June 1964. In 1965, a very weak emission is seen on the Hα line, followed, in 1966 and 1967, by a very weak absorption. During the « B star » phase, particularly in 1962 and 1963, the Hβ and Hγ absorption lines are very deep.

In 1968, the emission reappears strongly on the Hα line, and sharp dark cores are seen on the Hβ and Hγ lines, whose wings are very diffuse and are disturbed by emission. The Hα emission line becomes fainter in 1969, but the shell components remain.

From 1970 to October 1974, a distinct absorption is seen at Hα ; it seems fainter in 1975. During these observations, some fluctuations of the MgII λ 4481 line are observed.

– **HD 189687,** 25 Cyg, MWC 624 ; R_{1950}= 19h58.1m, D_{1950}=+36°54' ; sp. t. B3IV(1) ; v sin i = 230 kms^{-1} ; V = 5.19, B–V=–0.17, U–B=–0.69.

Observed from 1953 to 1975, this star exhibits a « B star » phase followed by a « Be star » phase. From 1953 to 1955, the Hα line is a hazy absorption which becomes narrow, deep and sometimes varies from 1957 to 1970.

In 1972, the Hα line is not distinguished from the continuum ; in 1974 and 1975, it seems a weak emission. When the Hα line is a weak absorption as in 1953-1954, or is diffuse as in 1957 and 1961, or is still in emission, a sharp dark core is observed on the Hγ photospheric line. During these observations, the narrow NaI and CaII absorption lines are seen.

– **HD 191610,** 28 Cyg, MWC 329 ; R_{1950}= 20h07.6m, D_{1950}= +36°41' ; sp. t. B21V-Vn(1), B3.5V(2) ; v sin i = 310 kms^{-1} ; V = 4.93, B–V=–0.13, U–B=–0.77.

Observed from 1953 to 1975, this star exhibits a « B star » phase followed by a « Be star » phase. From 1953 to 1959, the Hα line is dark, in 1960 it is no longer distinguished from the continuum, and in 1961 it is a moderately strong emission line. From 1962, the emission gradually increases, in 1966 appearing centrally on the Hβ absorption line and FeII$\lambda\lambda$ 4584, 5018, and 5169. A dark core due to a weak shell is seen centrally on the Hβ , Hγ and sometimes Hδ photospheric lines, from 1960 to 1962, and only on the Hγ and sometimes Hδ lines, from 1963 to 1970 (see illustration).

– **HD 192044,** 20 Vul, MWC 331 ; R_{1950}= 20h09.9m, D_{1950}= +26°20' ; sp.t. B8Vn(1), B8V(2) ; v sin i = 350 kms^{-1}; V = 5.92, B–V=–0.11, U–B=–0.43.

Observed from 1953 to 1975, this star exhibits very few changes. The Hα line is bright and strong, and Hβ is seen as a narrow, weak emission line centrally superposed on the photospheric component. Narrow weak dark cores are seen in 1960 and 1961 on the Hγ and Hδ photospheric lines.

– **HD 192445,** MWC 332 ; R_{1950}= 20h11.7m, D_{1950}= +36°11' ; sp. t. B1IV(1), B2V (2) ; V = 7.23, B–V=–0.08, U–B=–0.76.

Observed from 1953 to 1975, this star exhibits changes in emission. From 1953 to 1959, Hα is bright and very strong, and Hβ and Hγ are strong and moderate emission lines, respectively, each centrally superposed on a broad, hazy absorption. A weak trace of emission is seen on the Hδ photospheric line, and the FeII lines are bright and hazy. After 1959, the intensity of the emission gradually decreases : it is no longer seen on the Hγ line on 1970, and is faintly seen centrally on the broad Hβ absorption ; the FeII emission lines are no longer visible.

During the decrease in emission, a narrow dark core due to a shell component is seen from 1964 to 1972 on the Hδ line. A dark core is also seen on Hγ in 1971 just after the emission disappears. During these observations, the NaI and CaII absorption lines are deep.

– **HD 193009,** MWC 336 ; R_{1950}= 20h14.8m, D_{1950}= +32°13'; sp. t. B1Vn(1), B0V?(2) ; V = 7.16, B–V=+0.09, U–B=–0.84.

Observed from 1953 to 1976, this star exhibits strong emission lines. Hα is a wide, very strong emission, Hβ is strong, and Hγ is a weak emission centrally superposed on a broad, hazy absorption. The Hδ line which is always dark, is broad and diffuse ; the FeII lines are always bright and hazy. The emission weakens from 1975. During these observations, the HeI lines, particularly λλ4026, 4144, and 4471, are very deep absorptions ; the narrow NaI and CaII absorption lines are seen.

– **HD 193182,** MWC 632 ; R_{1950}= 20h15.6m, D_{1950}= +39°26' ; sp. t. B8(1) ; v sin i = 200 kms^{-1}; V=6.51, B–V=–0.09, U–B=–0.19.

Observed from 1953 to 1975, this star always exhibits a strong shell of hydrogen and ionized metals (FeII, TiII, SiII, CrII, and ZrII). The TiII and FeII lines are deep, and those of NaI and CaII are very deep. The Hα line is always bright and strong, and the other hydrogen lines always show a narrow, deep sharp core on the photospheric component when the wings of the Hβ line are disturbed by emission. There are very few changes in the spectrum of this star (see illustration).

– **HD 193911,** 25 Vul, MWC 341 ; R_{1950}= 20h19.9m, D_{1950}= +24°17' ; sp. t. B8III(1), B7IV-V(2) ; v sin i = 250 kms^{-1} ; V = 5.4, B–V=–0.06, U–B=–0.40.

Observed from 1954 to 1975, this star does not exhibit any changes in emission. Hα is a narrow, strong emission line, and Hβ is a very weak emission centrally superposed on the photospheric component.

– **HD 194335,** MWC 343 ; R_{1950}= 20h21.9m, D_{1950}= +37°19'; sp. t. B2Vn(1) ; V = 5.90, B–V=–0.20, U–B=–0.88.

Observed from 1953 to 1975, this star exhibits slight changes in the intensity of the emission. From 1953 to 1970, Hα is bright and strong, and Hβ is a weak emission centrally superposed on a broad, hazy absorption. Sharp dark cores due to a shell component are seen on the photospheric Hγ and Hδ lines.

After 1971, the emission becomes fainter and disappears from the Hβ line, which, in 1975, has a sharp dark core. During these observations, slight traces of FeII emission lines are seen.

– **HD 195325,** 1 Del, MWC 1019; R_{1950}= 20h27.9m, D_{1950}=+10°44' ; sp. t. A0(1), A0IV?(2); v sin i = 320 kms^{-1}; V = 6.08, B–V=–0.03, U–B=–0.11.

Observed from 1953 to 1964 and from 1969 to 1975, this star exhibits a very strong hydrogen and metallic shell. The Hα line is always dark at this dispersion ; the TiII, CrII, and FeII shell lines are numerous and deep, and the NaI and CaII absorption lines are also deep. No noticeable spectral variations are seen at this dispersion (see illustration).

– **HD 195554,** MWC 639 ; R_{1950}= 20h28.2m, D_{1950}= +55°54' ; sp. t. B9V(1), B9IV(2); v sin i = 250 kms^{-1}; V = 5.9, B–V=–0.04, U–B=–0.24.

Observed from 1953 to 1964 and from 1970 to 1975, this star does not exhibit any noticeable changes in emission. Hα is always a very weak emission line centrally superposed on a hazy absorption. The other hydrogen lines are deep absorptions.

– **HD 196712,** MWC 350 ; R_{1950}= 20h36.6m, D_{1950}=–2°35' ; sp.t. B7III(1), B7-8V(2) ; v sin i = 250 kms^{-1}; V=6.22, B–V=–0.10, U–B=–0.42.

Observed from 1953 to 1975, this star does not exhibit any noticeable changes in emission. The Hα line is bright and strong, and Hβ is a narrow, weak emission centrally superposed on a photospheric component.

– **HD 197419,** V 568 Cyg, MWC 1026 ; R_{1950}= 20h40.4m, D_{1950}=+35°17'; sp. t. B3IV(1) ; v sin i = 115 kms^{-1}; V = 6.66, B–V=–0.16, U–B=–0.68.

Observed from 1953 to 1965 and from 1970 to 1974, this star exhibits alternate « B star » and « Be star » phases. The Hα line is a weak absorption in 1953-1955 and is a very weak emission centrally superposed on a strong, hazy absorption in 1957 ; this emission increases very slightly in 1958-1959. In 1962, a sharp dark core on a hazy absorption is seen at Hα , the Hβ and Hγ lines also each have a sharp core, and the strength of the MgII λ 4481 absorption line increases. Hα is a weak, hazy absorption in 1963-1964, is not distinguished from the continuum in 1970, and then appears as an absorption again in 1971. In 1973-1974, it is a weak emission on a hazy absorption.

– **HD 198183,** λ Cyg, MWC 352 ; R_{1950}= 20h45.5m, D_{1950}= +36°18' ; sp. t. B5IV(1), B5-6V(2); v sin i = 155 kms^{-1}; V = 4.53, B–V=–0.11, U–B=–0.49 ; bin.

Observed from 1953 to 1976, this star has no emission lines in its spectrum. The Hα line is always a rather deep absorption, although the strength of the hydrogen lines seems to vary during these observations.

– **HD 199218,** MWC 356 ; R_{1950}= 20h52.5m, D_{1950}= +40°31'; sp. t. B6Vn(1), B7V(2); V = 6.70, B–V=–0.07, U–B=–0.41.

Observed from 1954 to 1976, this star exhibits very slight changes in emission. The Hα line is bright and strong, and H β is a moderate emission centrally superposed on a broad absorption. Between 1958 and 1964, the emission at H β seems to decrease slightly in intensity ; weak, sharp dark cores are seen then on the Hγ and Hδ photospheric lines (see illustration).

– **HD 199356,** MWC 357 ; R_{1950}= 20h53.5m, D_{1950}= +40°06' ; sp. t. B0(1) ; V = 7.13, B–V= +0.15, U–B=–0.76.

Observed from 1953 to 1975, this star exhibits changes in the intensity of the emission. From 1953 to 1958, the H α line is bright and strong and H β is moderate ; the H γ line is a weak, hazy absorption ; a sharp dark core is seen on the H δ photospheric line. The FeII lines are bright and hazy. During this period, the emission increases slightly, appearing centrally on the H γ line in 1957. Then the emission becomes distinctly stronger. At the end of 1960, emission is weakly present centrally on H δ , and the intensity of the FeII emission lines increases very perceptibly between H γ and λ 5500.

From 1963 to 1972, there is strong emission in the spectrum. In 1973, a sharp dark core is again seen in the H δ line, while the intensity of the H α , H β , and FeII lines remains strong.

During these observations, the NaI and CaII absorption lines are narrow and deep.

– **HD 200120,** f ^{1}Cyg, 59 Cyg, MWC 359 ; R_{1950}= 20h58.1m, D_{1950}= +47°19' ; sp. t. B1Vn(1), O9V?(2) ; v sin i = 375 kms^{-1}; V = 4.74 var, B–V=–0.05, U–B=–0.94.

Observed from 1953 to 1976, this star exhibits large changes in emission and a temporary strong shell of hydrogen, neutral helium, and ionized metals.

From 1953 to 1969, the Hα line is bright and strong ; H β and Hγ are moderate and weak emission lines, respectively, each centrally superposed on a broad absorption, and the FeII lines are bright and hazy. For this period, emission is at maximum strength in 1956 and 1961.

From 1970 to May 1971, emission is hardly visible on the Hβ line. A sharp dark core is clearly visible on the very hazy Hγ and H δ absorptions. At the end of 1971, the emission has strengthened on H β and has become visible centrally on the Hγ line ; the other hydrogen lines are very hazy absorptions because of a « veiling » effect. HeI λ 5876 is bright but weak and the HeI and FeII λλ 5016-5018 emission blend has strengthened ; the other HeI lines are more diffuse absorptions.

At the end of 1972, the emission has strengthened in the lines mentioned above and there is a hazy emission at λλ 4127-4131 (FeII-SiII). At a higher dispersion, a shell of hydrogen, neutral helium, and ionized metals is observed in June 1973.

From December 1973 to June 1974, a very prominent maximum of emission is observed on our plates ; it is seen on all the hydrogen, HeI and MgII lines ; the « veiling » effect is very strong. The Hα and Hβ bright lines are strong and the other hydrogen lines exhibit an emission component centrally on a broad absorption. The emission is distinguished very clearly on HeI λ 5876 and less clearly on the FeII lines.

In November and December 1974, a strong hydrogen, HeI, MgII, SiII, CaII, and NaI shell appears ; a « P Cygni » profile is observed on the H β and H γ lines ; and the HeI λ 5876 emission line is weaker. In June 1975, the shell is much less strong ; only the sharp dark cores still remain on the hydrogen lines. HeI λ 5876 is a stronger emission line.

In October 1975, the hydrogen shell is even weak, the intensity of the Hα and Hβ bright lines has decreased, and the emission has disappeared from the H γ line ; the emission is still visible, but weak, on HeI λ 5876. In 1976, no emission line is seen in the spectrum ; the Hα line is not distinguished from the continuum, and the widths of the H β and H γ absorptions have decreased. The observations from 1953 to 1957, on superpanchro plates, have not been reproduced (see illustration).

– **HD 200310,** 60 Cyg, MWC 360 ; R_{1950}= 20h59.4m, D_{1950}= +45°57' ; sp. t. B1V(1) ; v sin i = 320 kms^{-1}; V = 5.37, B–V=–0.21, U–B=–0.93 ; bin.

Observed from 1954 to 1976, this star exhibits great changes in emission and shows a temporary hydrogen shell.

In 1954, the H α line is not distinguished from the continuum ; from 1955 to the end of 1957, a very weak emission appears on Hα and Hβ is in absorption. From 1958 to 1964, the emission at Hα strengthens ; and some weak traces of FeII emission appear. The appearance of the H β line varies greatly during this period : in 1958 a sharp dark core is seen and the photospheric wings are very slight ; in 1960, Hβ shows only a diffuse absorption ; from 1961 to 1964, the photospheric Hβ line, though weak, is visible, and there seems to be a very weak emission broken by a sharp, distinct shell component. The H γ line is also variable, the wings of this line are very hazy, probably disturbed by emission, but the core is dark and distinct.

From 1964 to July 1976, the intensity of the H α emission line decreases ; the wings of the H β photospheric lines are more visible during this period. The sharp dark cores, of varying depths, are still present.

At the end of 1976, the H α emission line is moderate ; H β becomes a very hazy absorption, as does Hγ to a lesser degree.

– **HD 201733**, MWC 363 ; R_{1950}= 21h08.2m, D_{1950} = +45°18' ; sp. t. B4IV(1) ; V = 6.63, B–V=–0.16, U–B=–0.66.

Observed from 1954 to 1965 and from 1969 to 1975, this star exhibits large changes in the emission and shows a temporary hydrogen shell.

From 1954 to 1964, Hα is bright and strong ; the wings of the Hβ , Hγ and Hδ photospheric lines are very hazy and are disturbed by emission ; centrally, these lines have narrow, deep dark cores due to shell components.

The Hα emission line is moderate at the end of 1964, becoming very weak in 1965 ; during this decrease in emission intensity, the sharp dark cores remain visible on the Hβ , Hγ , and Hδ lines.

In 1969, Hα is a narrow, weak absorption, which deepens from 1970 to 1973, and then is again very weak in June 1974. At the end of 1974 and the beginning of 1975, Hα is not distinguished from the continuum. From 1969 to 1975, Hβ , Hγ and Hδ are broad absorptions. In October 1975, Hα is again bright and very strong ; Hβ is a moderate emission centrally superposed on a broad, very hazy absorption ; Hγ is a weak emission on a broad absorption ; and Hδ is dark and hazy.

During these observations, the narrow NaI and CaII absorption lines are present (see illustration).

– **HD 202904**, ν Cyg, MWC 364 ; R_{1950}= 21h15.9m, D_{1950}= +34°41' ; sp. t. B2V(1), B2V-IV(2) ; v sin i = 260 kms^{-1}; V = 4.43, B–V=–0.11, U–B=–0.82.

Observed from 1953 to 1976, this star exhibits strong emission lines in its spectrum. From 1953 to 1967, the Hα emission line is very strong and wide. Hβ , Hγ , and Hδ are bright, moderate, and very weak emission lines respectively, each centrally superposed on a broad absorption. The FeII lines are bright, strong, and numerous. From 1969 to 1972, the strength of the emission in the lines mentioned decreases : the FeII bright lines are hardly seen, and the emission disappears from the Hδ line which then exhibits a sharp dark core. At the end of 1973, the emission in the spectrum strengthens but is less strong than before 1965 (see illustration).

– **HD 203025**, MWC 365 ; R_{1950}= 21h15.9m, D_{1950} = +58°24' ; sp. t. B3III(1,2) ; v sin i = 175 kms^{-1}; V = 6.42, B–V=+0.20, U–B=–0.50 ; spectr. bin. P=5.4 d.

Observed from 1953 to 1965 and from 1970 to 1976, this star exhibits large changes in the Hα emission line. From 1953 to 1965, the Hα line is bright and strong. The wings of the Hβ photospheric line are hardly visible and are disturbed by emission ; a sharp dark core is sometimes visible on this line, particularly from 1961 to 1965.

In 1970, the Hα emission line is very weak, and sharp dark core is observed on the Hβ line. At the end of 1971, Hα is not distinguished from the continuum, and the Hβ line is a rather deep absorption.

From the end of 1973 to 1976, a very weak, fluctuating emission is seen centrally on the Hα line.

During these observations, the narrow NaI and CaII absorption lines are seen (see illustration).

– **HD 203064**, 68 Cyg ; R_{1950}= 21h16.6m, D_{1950} = +43°44' ; sp. t. O7-8II-III(1), O9(2) ; v sin i = 330 kms^{-1}; V = 5.00, B–V=–0.01, U–B=–0.94.

Irregularly observed from 1959 to 1976, this star exhibits a « Be star » phase followed by a « B star » phase. From 1959 to 1970, Hα is a moderately intense emission line ; at the end of 1971, it is no longer distinguished from the continuum. A weak absorption appears on this line in 1973-1974, becoming deeper in 1975-1976 (see illustration).

– **HD 203374**, MWC 366 ; R_{1950}= 21h17.9m, D_{1950} = +61°39'; sp. t. B0:V:(1) ; v sin i = 315 kms^{-1}; V = 6.68, B–V=+0.30, U–B=–0.75.

Observed from 1953 to 1975, this star exhibits strong emission lines in its spectrum. The Hα line is bright and very strong ; Hβ is strong ; Hγ and Hδ are moderate and weak emissions, respectively, each centrally superposed on a broad absorption and the Hϵ and H8 lines are diffuse absorptions. There may be a « veiling » effect in this violet part spectrum. The FeII lines are bright but hazy. There are not many spectral variations during these observations, although the bright lines, particularly the FeII ones, seem to be less strong before 1960. The narrow CaII and NaI absorption lines are present.

– **HD 203467**, 6 Cep, MWC 367 ; R_{1950}= 21h18.3m, D_{1950} = +64°40' ; sp. t. B3IV(1), B3III(2) ; v sin i = 150 kms^{-1}; V = 5.18, B–V=–0.04, U–B=–0.58.

Observed from 1953 to 1976, this star exhibits rather large changes in the emission lines. From 1953 to the end of 1957, Hα is a moderately strong emission line, and Hβ is a hazy absorption with traces of central emission.

From 1958 to 1963, the Hα emission line strengthens ; and Hβ is a distinct emission centrally superposed on a broad absorption ; this emission is stronger in 1958-1960 than in 1960-1963. From 1964 to 1968, Hα is a moderately strong emission line, and Hβ is a hazy absorption.

From 1969 to 1973, the emission strengthens again, and the spectrum is similar to that in the period 1958-1963. In 1973 the intensity of the emission decreases as in 1963.

In 1974, Hα is a moderate emission line, and Hβ is a hazy absorption. In 1975 and 1976, the emission is still decreasing on Hα, and the Hβ absorption is deeper. There are two emission maxima, the first in 1958-1961 and the second in 1969-1973.

During these observations, the narrow CaII and NaI absorption lines are present.

– **HD 203699,** MWC 368 ; R_{1950}= 21h21.2m, D_{1950}= +13°50' ; sp. t. B3IV(1) ; v sin i = 120 kms^{-1}; V = 6.86, B–V=–0.11, U–B=–0.57.

Observed rather irregularly from 1955 to 1975, this star exhibits large changes in emission.

From 1955 to 1958, Hα is very bright ; Hβ, Hγ, and Hδ are strong, weak, and very weak emissions, respectively, each centrally superposed on a hazy absorption.

In 1960-1961, in spite of the poor quality of the spectra it can be seen that the emission seems to decrease. In 1963 the emission is at a minimum strength : the Hα line remains bright and rather strong, Hβ is a weak emission centrally superposed on a broad absorption, and Hγ is an absorption line with a distinct core.

From 1967 to 1975, the emission strengthens and the spectrum is similar to that for 1956-1958.

During these observations, the narrow CaII and NaI absorption lines are present.

– **HD 205060,** MWC 371 ; R_{1950}= 21h29.7m, D_{1950}= +42°29' ; sp. t. B6Vn(1); V = 7.21, B–V=–0.01, U–B=–0.41.

Observed from 1954 to 1976, this star exhibits large changes in the intensity of the Hα emission line.

From 1954 to June 1956, Hα is a narrow strong emission line ; in 1957 and 1958, the emission decreases greatly so that from 1960 to 1962 the Hα line is not distinguished from the continuum ; Hβ is then a narrow, deep absorption. From 1963 to 1968, Hα is again a narrow strong emission line, becoming narrow and weak in 1969-1970 ; from 1971 to 1974, it becomes very weak, and the Hβ line is a deep absorption with a distinct core. After 1974, Hα is no longer distinguished from the continuum and Hβ is a strong absorption.

– **HD 205551,** MWC 641 ; R_{1950}= 21h32.7m, D_{1950}= +51°28' ; sp. t. B9III(1,2) ; v sin i = 150 kms^{-1}; V = 5.9, B–V=+0.02, U–B=–0.29.

Observed from 1953 to 1975, this star exhibits no noticeable spectral variations at this dispersion. Hα is a very weak emission centrally superposed on a hazy absorption (see illustration).

– **HD 205637,** ϵ Cap, MWC 373 ; R_{1950}= 21h34.3m, D_{1950}=–19°41' ; sp. t. B3V(1) ; v sin i = 295 kms^{-1}; V = 4.68 var, B–V=–0.17, U–B=–0.65.

Observed from 1956 to 1975, this star exhibits few changes in the emission lines ; a shell is always seen.

Hα is a rather strong emission line ; the Hβ, Hγ, and Hδ absorption lines each have a distinct deep core due to a shell component ; the wings of the Hβ and Hγ lines are very diffuse and are probably disturbed by emission.

Some traces of metallic shell lines are observed such as the FeII and SiII $\lambda\lambda$ 4128-4131. The NaI and CaII absorption lines are particularly narrow and distinct.

– **HD 206773,** MWC 376 ; R_{1950}= 21h40.8m, D_{1950}= +57°30' ; sp. t. B0:(1) ; v sin i = 480 kms^{-1}; V = 6.87, B–V=+0.23, U–B=–0.80.

Irregularly observed from 1955 to 1976, this star exhibits strong emission lines. Hα is a wide strong emission line, Hβ is strong ; and Hγ and Hδ are moderate and weak emissions, respectively, each centrally superposed on a hazy absorption. Some weak traces of emission are seen on Hϵ and H8. The « veiling » effect due to the reemission of the envelope is very important in the short wavelength region.

The FeII lines are broad, hazy emissions. HeI λ 5876 is bright, as is the HeI-FeII « blend » $\lambda\lambda$ 5016-5018. The CaII and NaI absorption lines are narrow and deep. During the observations the strength of the emission lines does not change much except in the FeII lines, which seem brighter from 1969.

– **HD 207232**, MWC 377 ; R_{1950}= 21h44.2m, D_{1950}= +50°27' ; sp. t. B8Vn(1), B8IV(2) ; v sin i = 330 kms^{-1}; V = 7.02, B–V=–0.06, U–B=–0.39.

Observed from 1955 to 1975, this star exhibits few changes in emission. Hα is bright and strong, Hβ is a very weak emission centrally superposed on the photospheric component, and the other hydrogen lines are deep absorptions. A narrow dark core due to a shell component is seen on the Hβ line in 1956 and on the Hβ and Hγ lines in 1963 and 1964.

– **HD 208057**, 16 Peg, MWC 644 ; R_{1950}= 21h50.8m, D_{1950}= +25°41' ; sp. t. B3V(1) ; v sin i = 150 kms^{-1}; V = 5.08, B–V=–0.17, U–B=–0.67.

Observed from 1953 to 1975, this star exhibits no emission lines in its spectrum during this period.

– **HD 208392**, EM Cep, MWC 380 ; R_{1950}= 21h52.4m, D_{1950}= +62°23' ; sp. t. B1III(1), B2III(2) ; v sin i = 280 kms^{-1}; V = 7.04, B–V=+0.26, U–B=–0.56.

Irregularly observed from 1955 to 1976, this star exhibits a « B star », then a « Be star », and again a « B star » phase.

From 1955 to 1964, Hα line is a hazy absorption. In 1969, this line is not distinguished from the continuum. From 1971 to 1975, Hα is a weak emission, and Hβ and Hγ have sharp dark cores due to a hydrogen shell, superposed on the absorptions. In 1976, the Hα line is again dark.

– **HD 208682**, MWC 381 ; R_{1950}= 21h54.2m, D_{1950} = +65°05' ; sp. t. B3Vn(1), B2V(2) ; v sin i = 350 kms^{-1}; V = 5.86, B–V=–0.06, U–B=–0.75.

Irregularly observed from 1954 to 1975, this star exhibits large changes in emission.

From 1954 to 1958, the Hα line is bright, very wide, and strong ; Hβ and Hγ are strong and weak emissions, respectively, each centrally superposed on a photospheric component. A sharp dark core due to a shell is seen on the Hδ line, which is a hazy absorption disturbed by emission. During this period, the intensity of emission decreases very gradually ; some very weak traces of FeII emission are seen from 1954 to 1957.

In 1963 and 1964, this star has emission only at Hα , and only weakly ; the other hydrogen lines are narrow, deep absorptions, with barely visible wings.

In 1968, the emission is stronger : Hα is strong and Hβ is a weak emission on a broad, hazy absorption ; sharp dark cores are seen on the Hγ and Hδ photospheric lines.

From 1970, the spectrum is similar to that observed on 1957 and emission is visible to the Hδ line ; FeII emission lines are present.

During these observations, the NaI and CaII lines are narrow, deep absorptions.

– **HD 209409**, o Aqr, MWC 384 ; R_{1950}= 22h00.7m, D_{1950}= –2°24' ; sp. t. B6V(1), B7IV(2); v sin i = 320 kms^{-1}; V = 4.69, B–V=–0.06, U–B=–0.41.

Observed from 1956 to 1975, this star exhibits few changes in emission. Hα is bright, wide, and strong, and Hβ is a moderate emission centrally superposed on a broad absorption. A hydrogen shell is always seen, and sharp dark cores are observed on Hγ , Hδ , and, sometimes, Hβ , particularly between 1959 and 1975 ; the shell components are very distinct during this period. There are some very weak traces of FeII emission lines broken by a central absorption, particularly in 1957 and 1958.

– **HD 210129**, 25 Peg, MWC 385 ; R_{1950}= 22h05.5m, D_{1950}=+21°28' ; sp. t. B7V(1), B8IV(2) ; V = 5.78, B–V=–0.10, U–B=–0.41.

Observed from 1953 to 1975, this star exhibits a « B star » phase followed by a « Be star » phase. In 1953, Hα is dark and weak ; the absorption becomes deeper from 1954 to 1957 and is again weak in 1958. In 1961 and 1962, Hα is a weak emission centrally superposed on a diffuse absorption. In 1963-1964, the emission gradually increases and Hα becomes strong from 1968 to 1975 ; then Hβ is a moderate emission line centrally superposed on a hazy absorption.

During these observations, the NaI and CaII absorption lines as well as some HeI lines seem to vary in strength.

– **HD 212044**, MWC 386 ; R_{1950}= 22h18.4m, D_{1950}= +51°36' ; sp. t. B1IV(1) ; V = 6.98, B–V= +0.04, U–B=–0.91.

Observed from 1954 to 1976, this star exhibits strong emission lines in its spectrum. Hα is a very strong, wide emission line ; Hβ is strong ; and Hγ , Hδ , and Hϵ are moderate, weak, and very weak emissions, respectively, each centrally superposed on the photospheric component. The FeII lines are bright and rather strong. During these observations, there is a slow variation of the emission, which has a slight minimum from 1958 to 1961. Then the emission strengthens, and the FeII bright lines are particularly strong from 1963 to 1974.

During these observations, the NaI and CaII absorption lines are narrow and deep.

– **HD 212076,** 31 Peg, MWC 387 ; R $_{1950}$= 22h19.1m, D$_{1950}$= +11°57' ; sp. t. B2V(1), B2IV(2) ; v sin i = 135 kms^{-1}; V = 5.01, B–V=–0.13, U–B=–0.81.

Observed from 1953 to 1975, this star exhibits large changes in the intensity of the emission. From 1953 to 1960, Hα is bright and strong ; Hβ and Hγ are moderate and weak emissions, respectively, each centrally superposed on a broad absorption and some traces of emission are seen centrally on the Hδ hazy absorption. From 1961, the emission decreases in intensity but remains visible to the Hδ line. In 1963, a minimum of the emission is reached : Hα is not distinguished from the continuum, the other hydrogen lines are distinct absorptions, and a sharp dark core is seen on Hβ and Hγ , and sometimes Hδ .

In 1964, Hα is again a weak emission ; in 1968-1969, emission is clearly visible on the hydrogen lines, the spectrum is similar to that observed in 1960 although emission is less strong ; in 1970-1971, emission weakens, it is scarcely visible on the Hγ absorption line ; from 1973 to 1975, emission strengthens and again affects centrally the Hδ line. The HeI and MgII absorption lines seem deeper at the minimum of emission (see illustration).

– **HD 212571,** π Aqr, MWC 388 ; R$_{1950}$= 22h22.7m, D$_{1950}$= +1°07' ; sp. t. B1V(1), B0.5III(2) ; v sin i = 300 kms^{-1}; V = 5.66, B–V=–0.03, U–B=–0.98.

Observed from 1953 to 1976, this star exhibits a gradual enhancement of the emission lines in its spectrum. From 1953 to 1955, Hα is bright and strong, Hβ is weak, and Hγ presents a hazy absorption in which the blue side is weaker than the red one ; a sharp dark core is seen centrally on the Hδ photospheric line. The FeII lines are weak emissions.

In 1956-1957, the Hβ line is brighter, and Hγ is a weak emission centrally superposed on a broad absorption ; a sharp dark core is sometimes seen on the Hδ line.

From 1958 to 1964, Hα is bright, wide, and very strong, Hβ is strong and emission is well seen centrally on the Hγ absorption line, where, as in 1953-1955, the absorption is more marked on the red than on the blue side. Sharp dark cores due to shell components may be present on the Hγ and Hδ lines in 1963-1964.

From 1967 to 1976, a maximum of emission is observed : emission appears weakly on the center of the Hδ line, the FeII bright lines are strong, and the NaI lines, which were deep absorptions, disappear in 1971 (see illustration).

– **HD 214168,** 8 Lac, MWC 390 ; R$_{1950}$= 22h33.7m, D$_{1950}$= +39°22' ; sp. t. B1V (1), B1-2V(2) ; v sin i = 350 kms^{-1}; V = 5.73, B–V=–0.15, U–B=–0.90.

Observed from 1953 to 1976, this star exhibits two « Be star » phases separated by a « B star » phase.

In 1953, the Hα line is bright and moderately strong, Hβ is a weak emission centrally superposed on a diffuse absorption, and Hγ is a weak absorption. At the end of 1955, the emission decreases in intensity and disappears from Hβ . At the end of 1957, the Hα line is not distinguished from the continuum ; in 1959 it appears as a weak absorption. In 1960-1961, the emission has completely disappeared from the spectrum and a shell is observed ; the hydrogen lines are deep absorptions with a sharp core. At the same time, the HeI lines are stronger and less diffuse, and MgII λ 4481 is weak but present.

At the end of 1962, Hα is a weak absorption, which then gradually disappears ; the HeI lines are always narrow and deep, and the hydrogen shell is still present. In 1963, a weak emission appears on Hα and then, in 1965, centrally on the Hβ photospheric line. The emission gradually increases to 1972, and then decreases and disappears from the Hβ line. In 1975-1976, the Hα line is a weak emission and the other hydrogen lines are deeper absorptions.

During these observations, the NaI and CaI absorption lines are present.

– **HD 216057,** MWC 393 ; R$_{1950}$ = 22h46.7m, D$_{1950}$= +54°09' ; sp. t. B6V(1), B8IV-V(2) ; v sin i = 370 kms^{-1}; V = 6.0, B–V=–0.07, U–B=–0.49.

Observed from 1953 to 1964 and from 1970 to 1976, this star exhibits changes in emission. From 1953 to 1960, the Hα line is bright and rather strong, and there is a weak central emission on the Hβ photospheric line.

From 1961 to 1964, the emission gradually decreases in intensity and disappears from the Hβ line. From 1970 to 1976, the Hα line is hardly visible and shows a very weak emission centrally superposed on a hazy absorption.

– **HD 217050**, EW Lac, MWC 394 ; R_{1950}= 22h54.9 m, D_{1950}=+48°25' ; sp. t. B3III(1), B2III?(2); v sin i = 350 kms^{-1}; V =5.43 var, B–V=–0.09, U–B=–0.53.

Observed from 1958 to 1976, this star exhibits strong emission lines and a strong hydrogen and metallic shell. Hα is a wide, very strong emission line, and Hβ is a rather strong emission divided by a narrow, distinct absorption. The wings of the Hγ and Hδ lines are very hazy and are disturbed by emission. A sharp dark core due to a shell component is seen on every Balmer line except Hα , where the dispersion is too low. The FeII lines are also in emission, each divided by a narrow absorption. The NaI and CaII absorption lines are particularly deep, and those of SiII and MgII are distinct. This star, which has given rise to many papers, is known to exhibit rapid spectral changes, particularly during a single night. During these observations, some fluctuations are seen in the strength of the shell lines (FeII, TiII, CrII, SiII, CaII, and MgII). In 1976, there is a decrease in the intensity of the emission lines associated with a weakening of the shell (see illustration).

– **HD 217543**, MWC 395 ; R_{1950}=22h58.6m, D_{1950}=+38°26' ; sp.t. B2V(1), B4V(2) ; v sin i = 370 kms^{-1}; V=6.54, B–V=–0.11, U–B=–0.65.

Observed from 1953 to 1976, this star exhibits a « Be star » phase followed by a « B star » phase. From 1953 to 1957, the Hα line is bright and moderately strong. A sharp dark core due to a shell component is seen on the other Balmer lines. The wings of the Hβ and Hγ lines are very hazy and are disturbed by emission ; the HeI absorption lines are very diffuse.

From 1958, the Hα line is a very weak emission and is hardly distinguished from the continuum ; the other hydrogen lines are in absorption, and the strength of the sharp dark cores decreases.

In 1960-1961, Hα is a weak absorption ; from 1962 to 1976, the emission and the shell components disappear from the spectrum.

During the observations, the NaI and CaII absorption lines are weak and seem to vary.

– **HD 217675**, o And ; R_{1950}= 22h59.6m, D_{1950}= +42°03' ; sp. t. B6III(1); v sin i = 330 kms^{-1}; V = 3.62 var, B–V=–0.09, U–B=–0.53.

This star is known to exhibit some rapid fluctuations (about 1 day) in the profiles of the lines, and our observations are not suitable for its study. However, from one spectrogram to another, the Hα line undergoes large changes ; sometimes it is a narrow, distinct absorption, and sometimes it is hardly seen.

The other hydrogen, and the HeI and MgII lines, vary greatly in width and depth.

– **HD 217891**, βPsc, MWC 396 ; R_{1950}= 23h01.3m, D_{1950}=+3°33' ; sp.t. B6III(1) ; v sin i = 130 kms^{-1}; V = 4.53, B–V=–0.12, U–B=–0.49.

Observed from 1953 to 1976, this star exhibits a slow change in the intensity of the emission. From 1953 to 1964, a gradual decrease in the emission is observed : at first, the Hα line is bright and strong, while Hβ and Hγ are moderate and very weak emissions, respectively, each centrally superposed on the photospheric absorption. The emission disappears from Hγ in 1963, when the Hα emission line is moderate. The observations in 1969 show a notable increase in the emission, which is seen centrally on the Hδ photospheric line. At that time the Hα bright line is wide and very strong, and Hβ and Hγ are rather strong and moderate emissions, respectively, each centrally superposed on an absorption. After this not many changes are observed to 1976.

– **HD 218393**, MWC 397 ; R_{1950}= 23h04.9m, D_{1950}= +49°55' ; sp. t. B0IV-III(2); V = 7.02, B–V=+0.39, U–B=–0.36; spectr. bin. P=38d.

This star has already given rise to detailed studies ; it is known to show variations in the strength and the profiles of the lines. Hydrogen shell lines are always seen, but their strength varies. Metallic shell lines appear regularly, with a period of about 38 days.

This star was observed from 1953 to 1976. We verified that the metallic shell lines do indeed appear with a 38-day cycle ; however, on 2 plates taken on the same day or on two consecutive days, the strength of the shell varies significantly (this is seen especially on the TiII absorption lines).

Hα is bright, and very strong and very wide. Hβ is bright and moderately strong, and has complex profile disturbed by variable absorption. The other hydrogen lines are very much disturbed by a strong shell component. The Hγ and Hδ absorption lines, whose wings seem to be disturbed by emission, are narrow and deep. The metallic shell lines chiefly consist of FeII, TiII, and CrII ; they are particularly strong toward the maximum of strength of the shell, especially from 21 to 27 September 1958, from 6 to 13 July 1959, and from 3 to 10 August 1960. The MgII and metallic lines strengthen together.

When the strength of the metallic shell lines decreases, the Hγ and Hδ (and sometimes Hβ) lines exhibit a « P Cygni » profile, especially from 27 to 29 September 1958, from 28 October to 2 November 1961, and from 1 to 5 December 1969. Then the CaII K line seems in narrower absorption while remaining exceptionally strong, as do the NaI lines. The TiII absorption lines are particularly variable over the 38-day cycle.

This star is very difficult to classify in the MK system : when the FeII, TiII, and CrII shell lines disappear, the SiII, MgII, NaI, and CaII lines are always present and strong. It is difficult, at this dispersion, to estimate the shell contribution.

– **HD 218674** ; R_{1950}= 23h07.0m, D_{1950}= + 49°23' ; sp. t. B3Vn(1) ; v sin i = 255 kms^{-1}; V = 6.74, B–V=0.00, U–B=–0.57.

Observed from 1958 to 1976, this star exhibits few changes in emission ; a hydrogen shell of variable strength is quasi - permanent. The Hα line is bright and strong ; the Hβ , Hγ , and, often, Hδ lines show a sharp dark core due to a shell component. The wings of the Hβ and Hγ lines are hazy and are disturbed by emission. The NaI and CaII absorption lines are very narrow.

– **HD 224544,** MWC 406 ; R_{1950}= 23h56.3m, D_{1950}= +32°06'; sp. t. B6Vn(1), B7IV?(2) ; V= 6.52, B–V=–0.11, U–B=–0.57.

Observed from 1954 to 1976, this star exhibits large changes in the emission lines and has a temporary shell. From 1954 to 1970, the Hα bright line is strong. Hβ and Hγ are moderate and very weak emissions, respectively, each centrally superposed on a broad absorption ; a sharp dark core partially masks the emission component of the Hγ line. A sharp core is also seen on Hδ and sometimes on Hγ , particularly between 1964 and 1969. A maximum of the emission intensity is observed in 1960-1962 ; some very weak FeII emission lines are seen from 1954 to 1963. From 1971, the emission gradually decreases, disappearing from Hγ and becoming hardly visible on Hβ ; it then disappears from this line in 1973, when the Hα bright line is moderately strong.

During these observations, the NaI and CaII absorption lines are weakly present, and the SiII lines seem to vary (see illustration).

– **HD 224559,** MWC 407 ; R_{1950}= 23h56.2m, D_{1950}= +46°08' ; sp.t. B4Vn(1,2) ; V = 6.54, B–V=–0.09, U–B=–0.61.

Observed from 1953 to 1976, this star exhibits a slow variation of the intensity of the emission. The Hα line is bright and strong ; Hβ and Hγ are moderate and weak emissions, respectively, each centrally superposed on a broad absorption. The FeII bright lines are seen from 1953 to 1966.

From 1969, the emission gradually decreases in the spectrum and disappears from Hγ in 1974 (see illustration).

TABLE 2 – LIST OF OBSERVATIONS

		1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
HD	144	X	X	X	X	X	X				X	X	X				X	X	X	X	X	X	X	X	X
HD	**698**	X	X	X	X	X	X			X	X	X	X		X			X		X	X	X	X	X	X
HD	4180	X	X	X	X	X	X		X		X	X	X				X	X	X	X	X	X	X	X	X
HD	5394	X	X		X	X			X	X	X	X	X				X	X	X			X	X	X	X
HD	6343	X	X	X	X	X	X		X		X	X			X		X	X	X	X	X	X	X	X	X
HD	**6811**		X	X	X		X		X	X	X	X					X		X	X	X	X	X	X	X
HD	9709	X	X	X	X	X	X		X	X	X	X	X				X	X	X	X	X	X	X	X	X
HD	10516	X	X	X	X	X	X		X	X	X	X	X				X	X	X	X	X		X	X	X
HD	11606	X	X	X	X	X	X		X	X	X	X					X	X	X	X		X	X	X	X
HD	18552	X		X	X	X			X		X	X	X				X	X	X	X	X	X	X	X	X
HD	19243	X	X	X		X	X		X		X	X	X					X	X	X	X	X	X	X	X
HD	20336		X	X	X	X	X		X	X	X	X	X				X	X	X	X	X	X	X	X	X
HD	**21641**					X	X		X		X	X	X					X		X	X	X	X	X	
HD	**22192**					X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X
HD	**22780**	X	X	X		X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X
HD	23302			X	X	X	X	X	X	X	X		X				X	X		X	X	X	X	X	X
HD	23480	X	X	X	X	X	X	X	X				X				X	X	X	X	X	X	X	X	X
HD	23552		X	X		X	X		X		X	X					X	X	X	X	X	X	X	X	X
HD	23630	X		X	X	X	X	X	X	X	X		X				X	X		X	X	X	X	X	X
HD	**23862**	X		X	X	X	X	X	X			X	X				X		X	X	X	X	X	X	X
HD	24479			X		X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X
HD	**24534**	X		X	X	X	X	X	X	X	X	X	X				X			X	X		X	X	X
HD	25940	X		X	X	X		X	X	X	X	X			X			X	X	X	X	X	X	X	X
HD	26398			X	X	X	X				X	X	X				X	X		X	X	X	X	X	
HD	28497			X	X	X	X		X	X	X	X	X				X	X	X	X	X	X		X	
HD	29866	X		X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X	
HD	30076			X	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X		X	
HD	**32343**			X		X	X	X		X		X	X						X	X	X	X	X		
HD	32991		X	X	X	X			X	X	X	X	X		X			X	X	X	X	X	X		
HD	**33328**			X	X	X		X	X	X	X	X	X				X	X	X	X	X	X	X	X	
HD	33988			X						X	X	X	X				X	X	X	X	X	X	X	X	
HD	35439	X	X	X	X	X		X			X	X	X				X	X	X	X	X	X	X	X	

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
HD 36576		X	X	X	X		X	X	X		X	X				X	X	X	X	X	X		X	
HD 37202	X		X		X		X	X	X	X		X				X			X	X	X	X	X	X
HD 37490			X	X	X		X	X	X	X	X	X				X	X		X	X	X	X	X	
HD 37657			X		X				X		X	X		X		X	X	X	X	X	X	X	X	
HD 37967			X		X		X	X	X	X	X	X		X			X		X	X	X		X	
HD 38010			X	X	X			X	X	X	X	X		X		X	X	X	X	X	X		X	
HD 40978			X		X		X		X		X	X					X	X	X	X	X	X	X	
HD 41335			X		X		X	X	X			X					X	X	X	X	X	X	X	
HD 41511			X				X		X	X		X					X	X	X	X	X	X		
HD 43285		X	X		X				X		X	X					X		X	X	X			
HD 44458			X		X				X	X	X		X				X	X	X	X	X	X		
HD 44996			X					X	X	X		X					X	X	X	X	X	X		
HD 45314		X	X		X						X			X		X	X		X	X	X		X	
HD 45542		X	X	X	X			X	X	X	X	X				X	X		X	X	X		X	
HD 45725			X		X			X	X	X	X	X					X	X	X	X	X		X	
HD 45910			X		X		X	X	X	X		X				X	X	X	X	X	X			
HD 45995		X	X		X		X	X				X				X			X	X	X			
HD 47054		X	X		X		X	X	X	X		X						X	X	X	X	X		
HD 50083			X				X	X			X			X			X	X	X	X	X			
HD 50138		X	X		X		X	X	X	X	X	X				X	X	X	X	X	X	X		
HD 50658		X	X		X	X	X	X	X	X	X	X		X		X	X	X	X	X	X		X	
HD 50820			X		X		X	X	X	X		X					X		X	X	X			
HD 51354		X	X		X			X						X				X		X	X			
HD 51480			X		X					X						X	X	X	X	X				
HD 52721			X		X		X		X					X		X		X	X	X	X		X	
HD 53367			X		X				X					X		X	X		X	X	X		X	
HD 53416			X		X			X	X	X		X				X	X	X	X	X	X	X		
HD 53974			X					X	X		X	X							X	X	X		X	
HD 58050		X	X		X		X	X	X		X	X				X	X	X	X	X	X		X	
HD 58343			X		X				X				X					X	X	X	X			
HD 58715			X		X			X	X	X		X				X	X	X	X	X	X	X		
HD 60855		X			X			X	X									X	X	X	X	X		
HD 61224					X			X	X									X		X	X		X	
HD 62367								X	X	X					X	X	X	X		X	X		X	

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
HD 65875			X			X	X	X	X	X						X	X	X	X	X	X		X	
HD 71072								X	X	X						X	X	X	X	X	X	X		
HD 89884		X	X		X	X		X	X									X		X	X			
HD 91120		X	X		X	X		X	X	X	X							X		X	X	X	X	
HD 109387		X	X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
HD 138749	X		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
HD 141569			X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
HD 142926	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
HD 142983	X	X	X	X			X	X	X	X	X	X	X	X	X			X		X	X	X	X	
HD 148184	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
HD 162428		X		X		X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	
HD 162732			X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	
HD 164284	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
HD 164447	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
HD 168797	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
HD 168957			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
HD 169033		X	X	X	X	X	X	X	X	X		X	X	X				X	X	X		X	X	
HD 171406				X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
HD 171780		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X
HD 173371			X	X	X	X		X	X			X			X		X	X		X		X	X	
HD 174105	X	X	X	X	X	X	X	X	X	X						X		X	X		X	X	X	
HD 174237	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X	X
HD 175511				X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	
HD 175863	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X		X	X	X	
HD 175869	X			X	X	X	X	X	X	X	X	X		X	X		X	X	X		X	X	X	
HD 177648	X	X	X	X	X	X	X	X	X	X	X	X		X				X	X		X	X	X	
HD 178175			X	X	X	X		X	X			X						X	X	X		X	X	
HD 179343	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X			X		X	
HD 183362	X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X		X	X	X
HD 183656	X	X		X	X	X		X	X		X	X	X	X		X	X	X	X	X				
HD 183914			X	X	X	X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	
HD 184279	X			X	X			X			X	X		X			X	X			X	X	X	X

	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
HD 185037	X		X	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X		X	X	
HD 187657	X		X	X	X	X		X	X		X	X		X	X	X		X		X	X	X	X	
HD 187811	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
HD 189687	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X		X	X	
HD 191610	X	X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X	X	X	X	
HD 192044	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X		X	X	
HD 192445	X	X	X	X	X	X	X	X				X			X			X	X		X	X	X	
HD 193009	X	X	X	X	X	X		X	X	X		X			X	X	X	X	X		X		X	X
HD 193182	X	X		X	X	X	X	X				X	X		X		X	X	X	X		X	X	
HD 193911		X	X	X	X	X	X		X			X		X	X		X	X	X	X		X	X	
HD 194335	X			X	X	X	X	X	X	X		X	X			X		X	X	X		X	X	
HD 195325	X	X	X	X	X	X		X		X		X					X	X	X	X			X	
HD 195534	X	X	X	X	X	X		X	X	X	X	X						X	X	X		X	X	
HD 196712	X	X		X	X	X		X				X			X			X	X			X	X	
HD 197419	X		X	X	X	X		X		X	X	X	X					X	X		X	X		
HD 198183	X	X	X	X	X	X		X	X	X	X	X	X	X		X		X	X	X		X	X	X
HD 199218		X	X	X	X	X		X			X	X	X		X			X	X		X	X	X	X
HD 199356	X		X	X	X	X		X			X		X		X			X	X		X	X	X	
HD 200120	X		X	X	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
HD 200310		X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	X		X	X	X	X
HD 201733		X	X	X	X	X	X	X	X		X	X	X				X	X	X		X	X	X	
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HD 203374	X	X	X	X	X	X	X	X	X		X		X					X	X		X	X	X	
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HD 206773			X	X	X	X		X		X	X	X					X	X	X			X		X
HD 207232		X	X	X	X	X		X			X	X		X			X	X	X		X		X	

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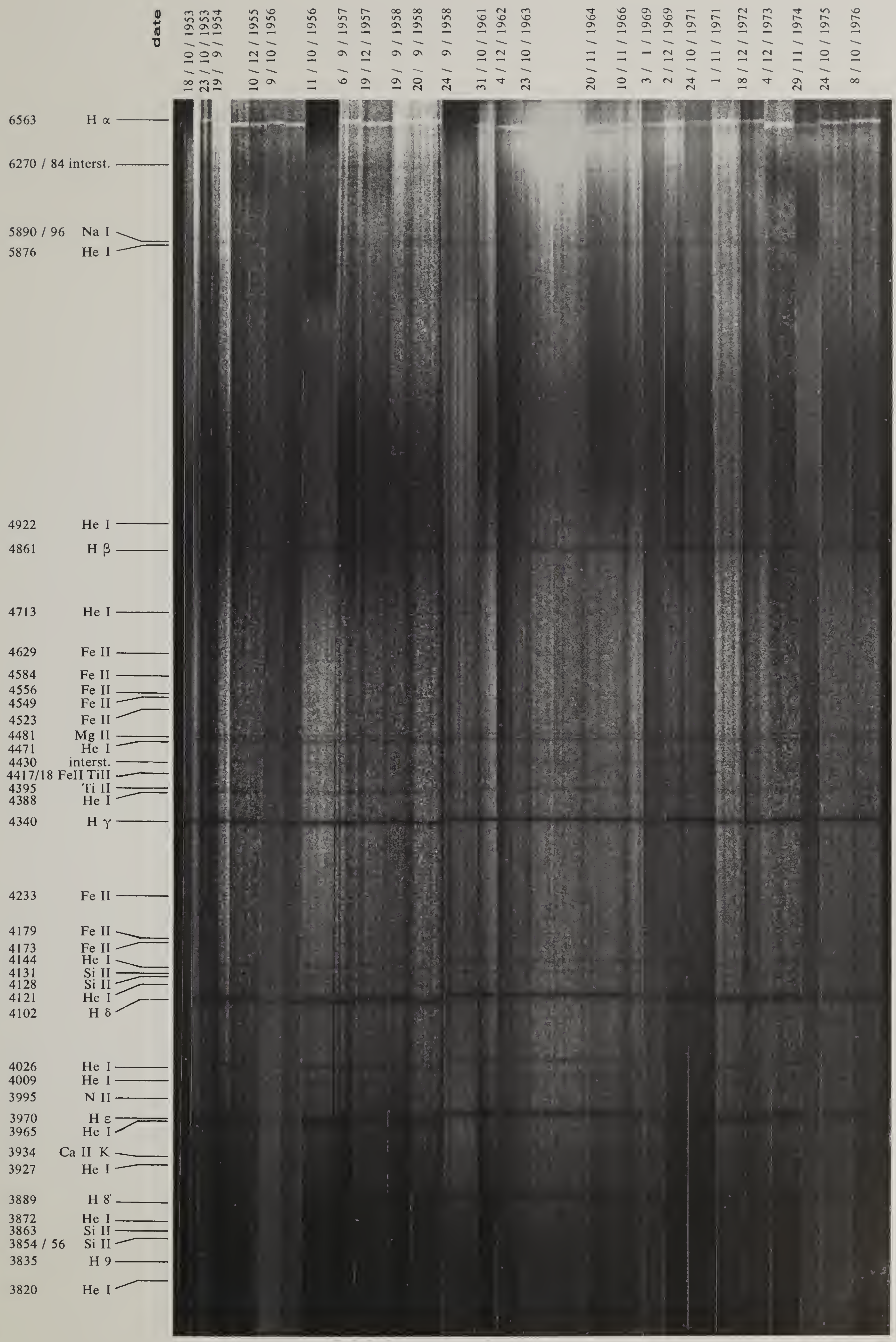
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8 / 10 / 1976
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
4922 He I
4861 H β
4713 He I
4629 Fe II
4584 Fe II
4556 Fe II
4549 Fe II
4523 Fe II
4481 Mg II
4471 He I
4430 interst.
4417/18 FeII TiII
4395 Ti II
4388 He I
4340 H γ
4233 Fe II
4179 Fe II
4173 Fe II
4144 He I
4131 Si II
4128 Si II
4121 He I
4102 H δ
4026 He I
4009 He I
3995 N II
3970 H ε
3965 He I
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3927 He I
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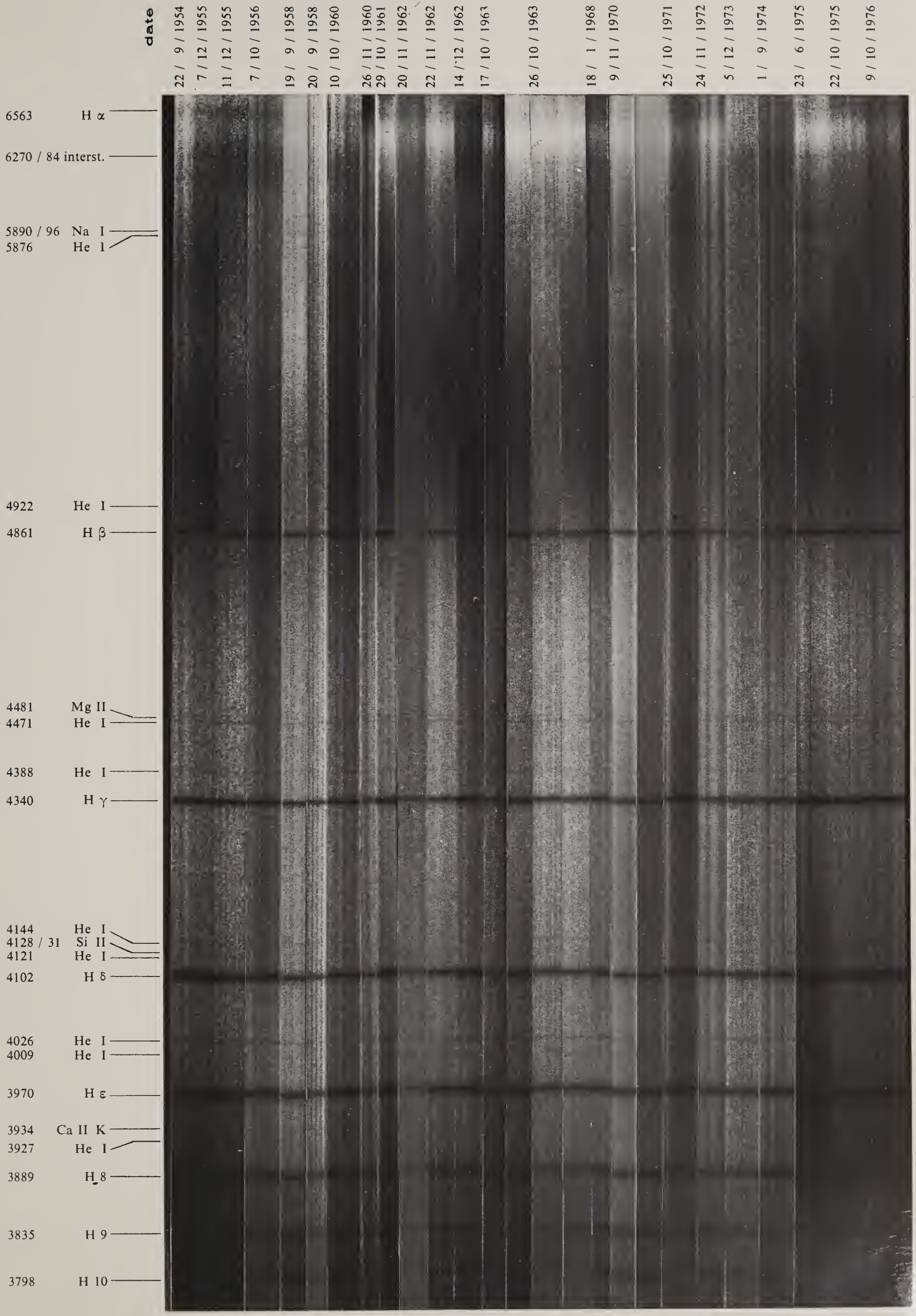
3872 He I
3863 Si II
3854 / 56 Si II
3835 H 9
3820 He I

HD 698

HD 6811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9 / 10 / 1976
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5876 He I
4922 He I
4861 H β
4481 Mg II
4471 He I
4388 He I
4340 H γ
4144 He I
4128 / 31 Si II
4121 He I
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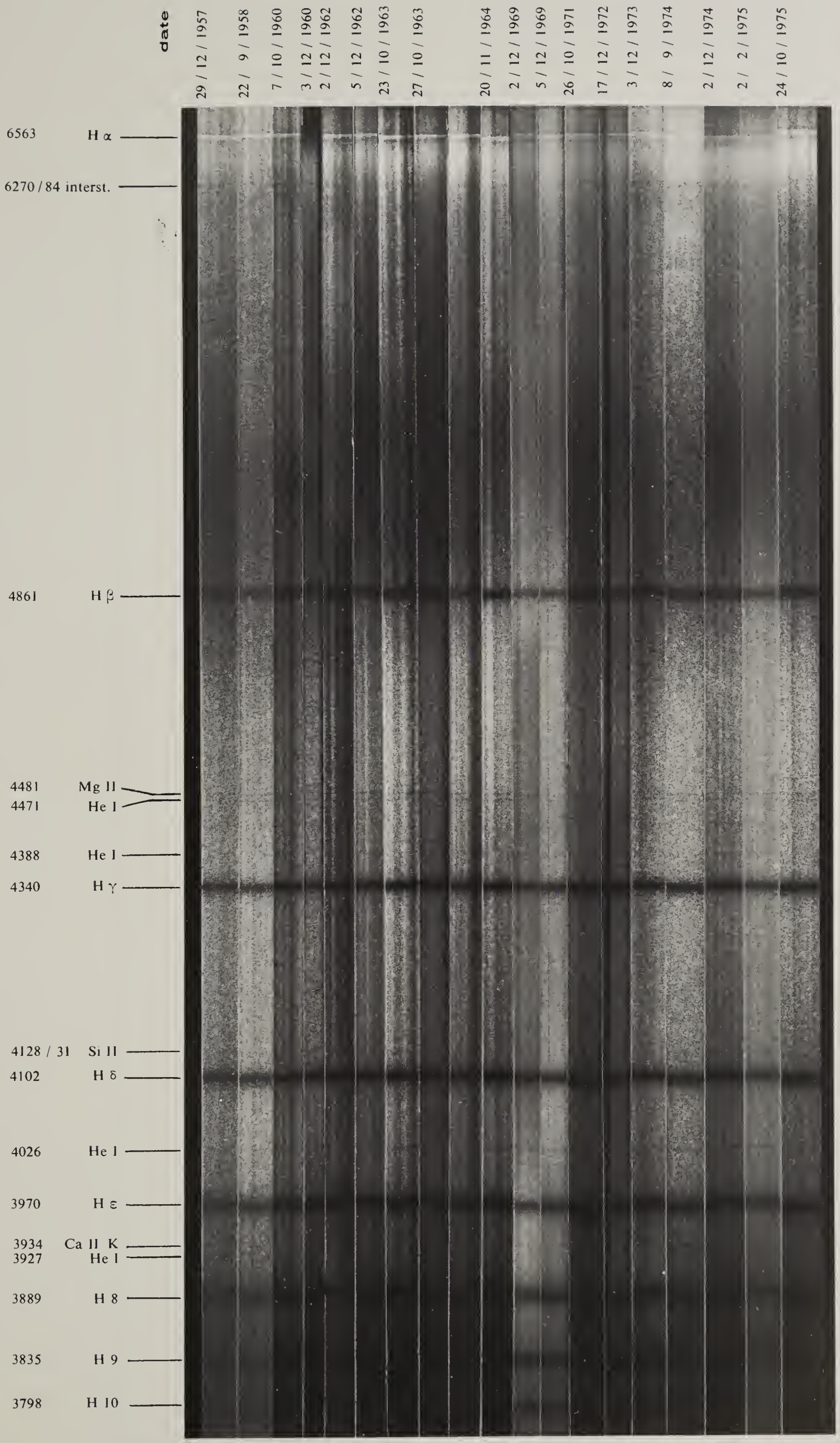
3927 He I
3889 H 8
3835 H 9
3798 H 10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24 / 10 / 1975
6563 H α
6270 / 84 interst.
4861 H β
4481 Mg II
4471 He I
4388 He I
4340 H γ
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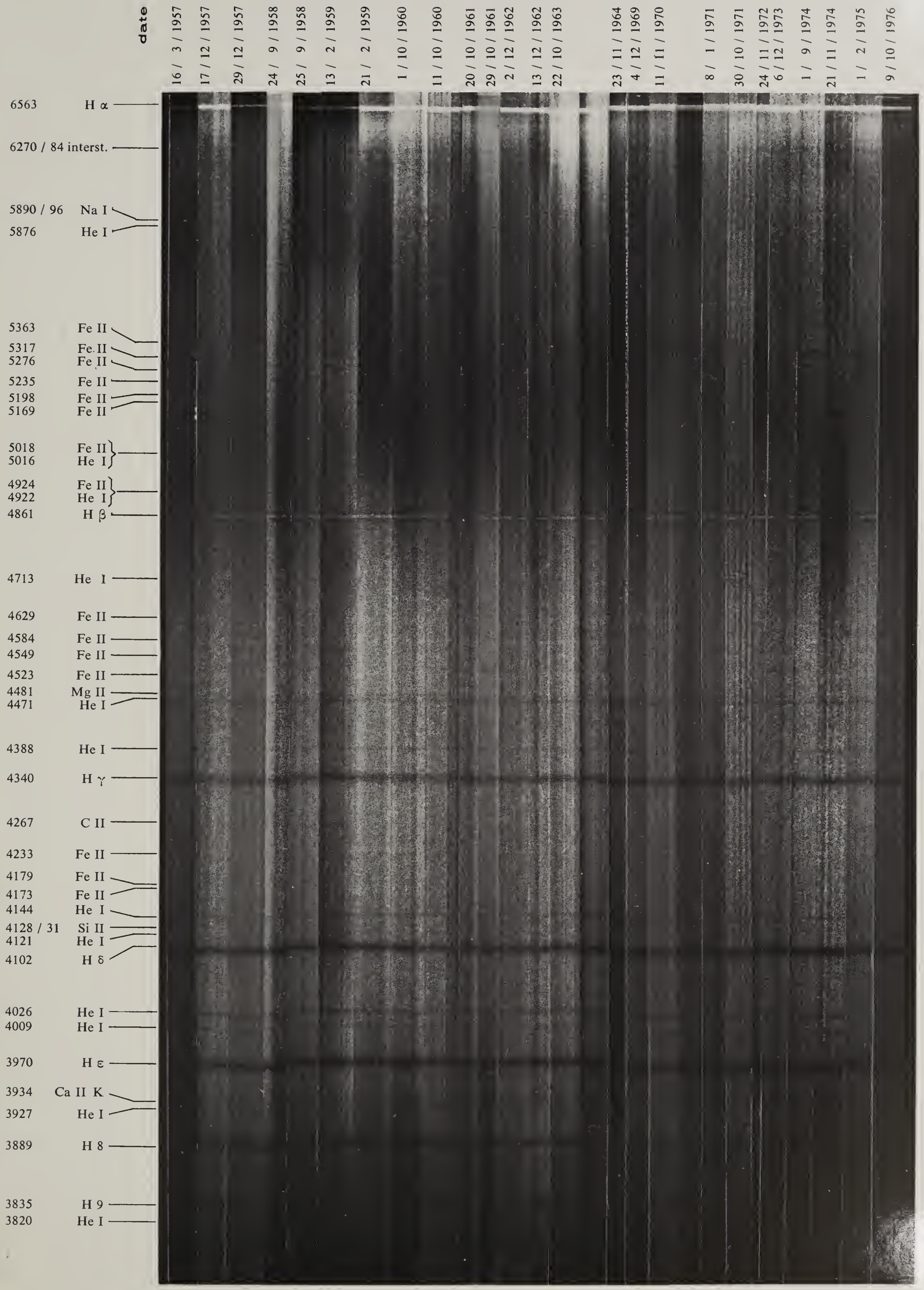
3835 H 9
3798 H 10

HD 21641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24 / 11 / 1972
6 / 12 / 1973
1 / 9 / 1974
21 / 11 / 1974
1 / 2 / 1975
9 / 10 / 1976
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6270 / 84 interst.
5890 / 96 Na I
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5363 Fe II
5317 Fe II
5276 Fe II
5235 Fe II
5198 Fe II
5169 Fe II
5018 Fe II
5016 He I
4924 Fe II
4922 He I
4861 H β
4713 He I
4629 Fe II
4584 Fe II
4549 Fe II
4523 Fe II
4481 Mg II
4471 He I
4388 He I
4340 H γ
4267 C II
4233 Fe II
4179 Fe II
4173 Fe II
4144 He I
4128 / 31 Si II
4121 He I
4102 H δ
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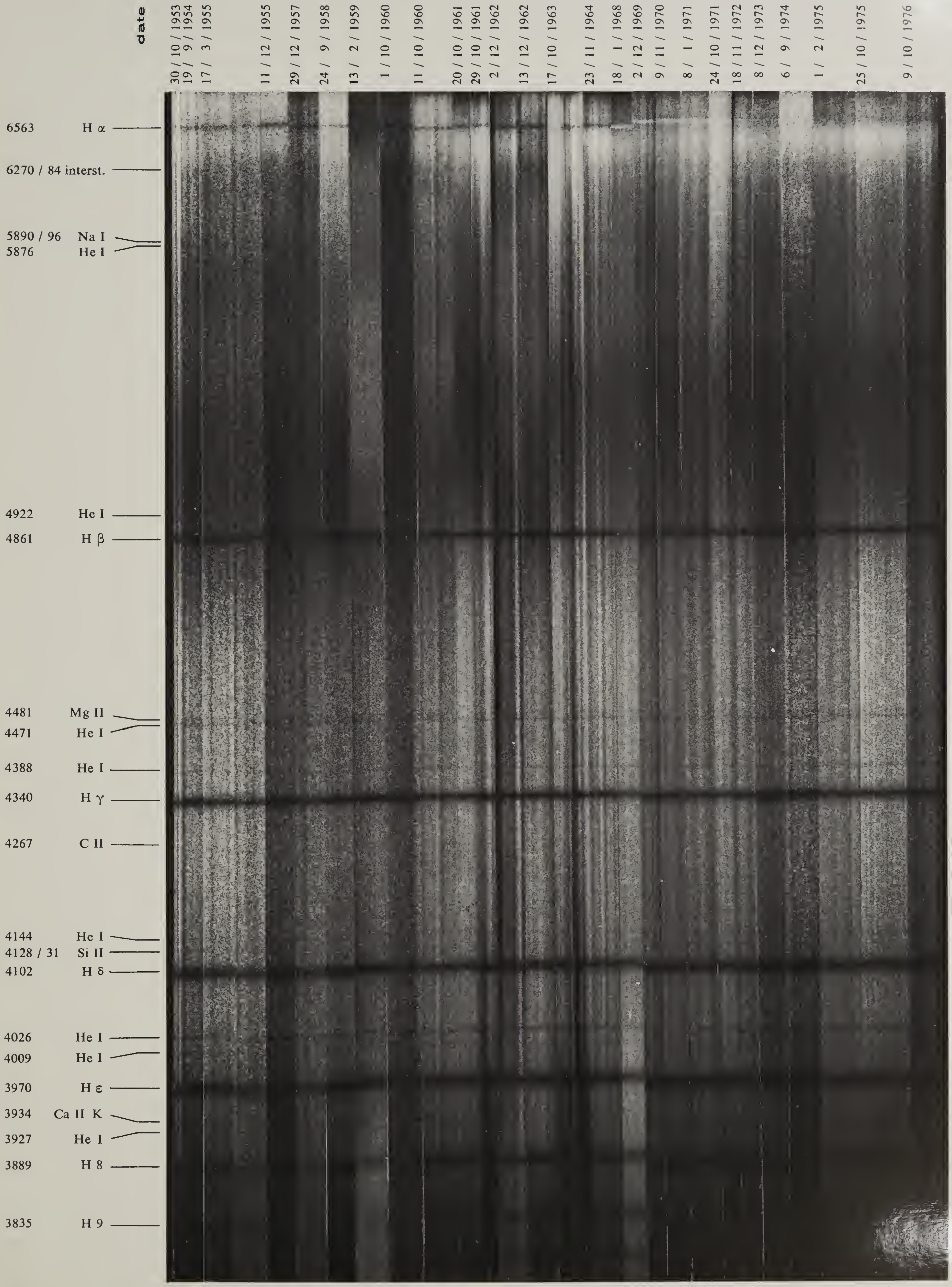
3927 He I
3889 H 8
3835 H 9
3820 He I

HD 22192

HD 22 780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6270 / 84 interst.
5890 / 96 Na I
5876 He I
4922 He I
4861 H β
4481 Mg II
4471 He I
4388 He I
4340 H γ
4267 C II
4144 He I
4128 / 31 Si II
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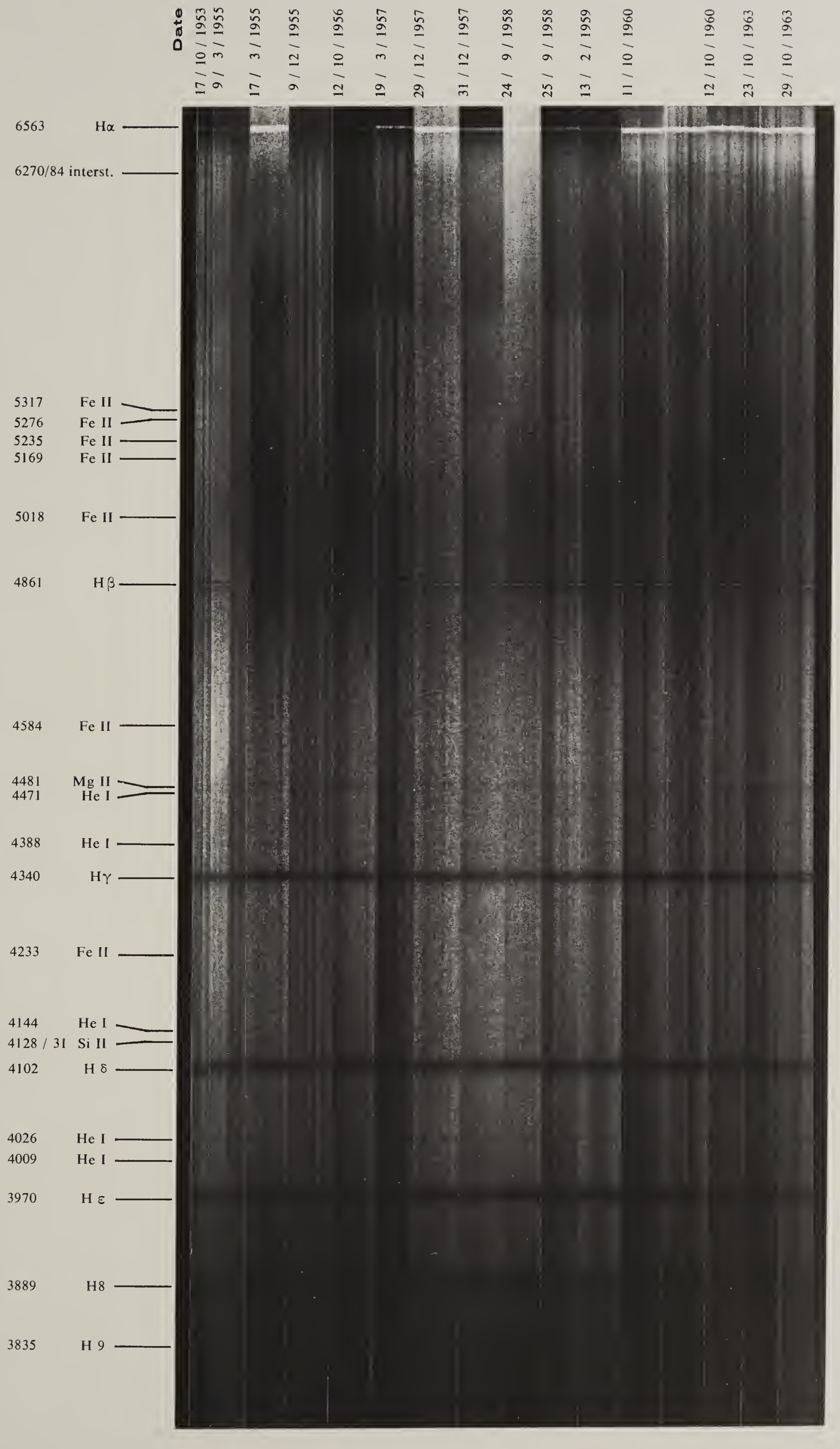
HD 23 862 (1)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29 / 10 / 1963
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6270/84 interst.
5317 Fe II
5276 Fe II
5235 Fe II
5169 Fe II
5018 Fe II
4861 Hβ
4584 Fe II
4481 Mg II
4471 He I
4388 He I
4340 Hγ
4233 Fe II
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4102 H δ
4026 He I
4009 He I
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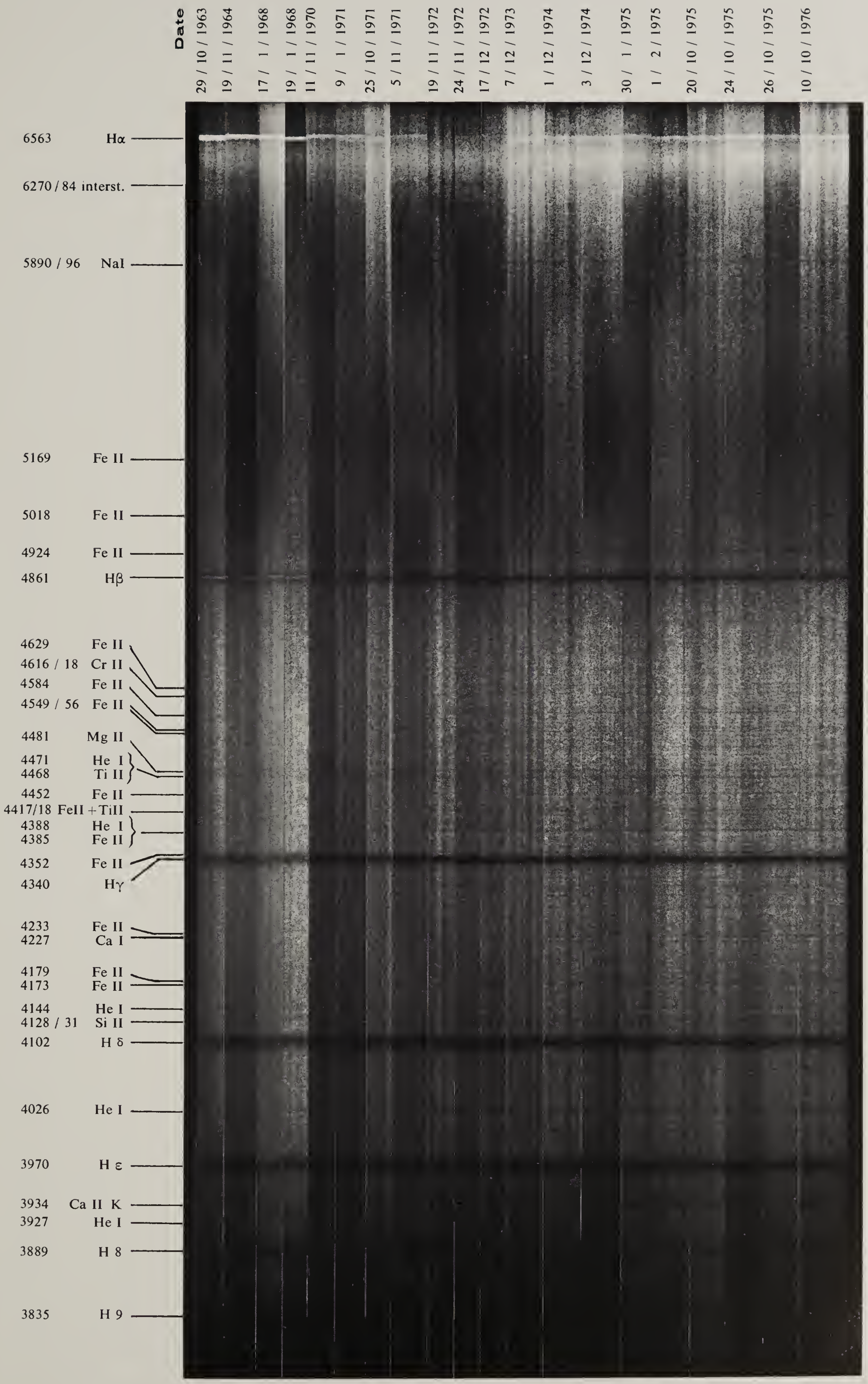
3889 H8
3835 H 9

HD 23 862 (2)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3 / 12 / 1974
30 / 1 / 1975
1 / 2 / 1975
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26 / 10 / 1975
10 / 10 / 1976
6563 Hα
6270 / 84 interst.
5890 / 96 NaI
5169 Fe II
5018 Fe II
4924 Fe II
4861 Hβ
4629 Fe II
4616 / 18 Cr II
4584 Fe II
4549 / 56 Fe II
4481 Mg II
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4468 Ti II
4452 Fe II
4417/18 FeII + TiII
4388 He I
4385 Fe II
4352 Fe II
4340 Hγ
4233 Fe II
4227 Ca I
4179 Fe II
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4102 H δ
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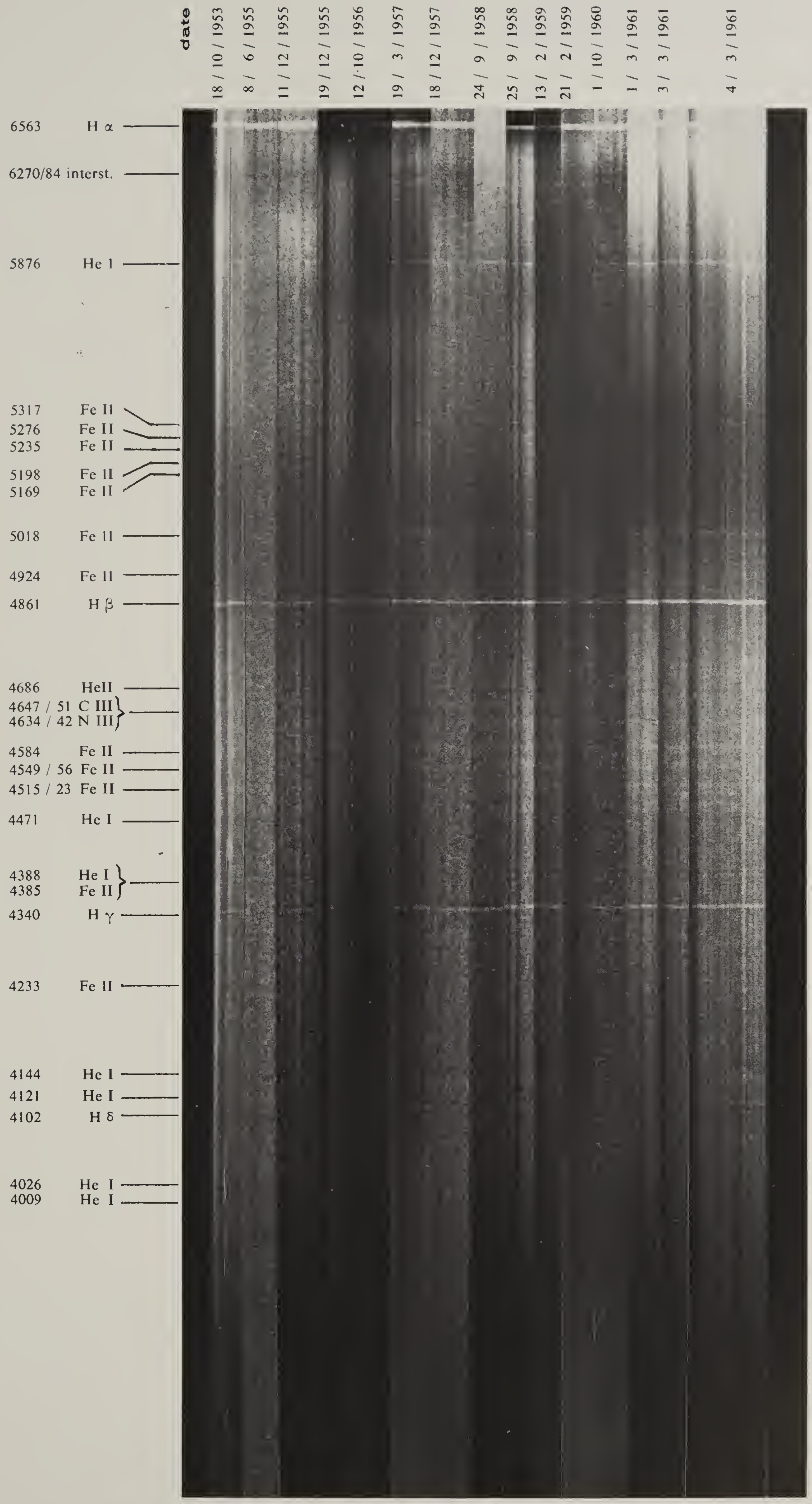
3934 Ca II K
3927 He I
3889 H 8
3835 H 9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1 / 10 / 1960
1 / 3 / 1961
3 / 3 / 1961
4 / 3 / 1961
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6270/84 interst.
5876 He I
5317 Fe II
5276 Fe II
5235 Fe II
5198 Fe II
5169 Fe II
5018 Fe II
4924 Fe II
4861 H β
4686 HeII
4647 / 51 C III
4634 / 42 N III
4584 Fe II
4549 / 56 Fe II
4515 / 23 Fe II
4471 He I
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4026 He I
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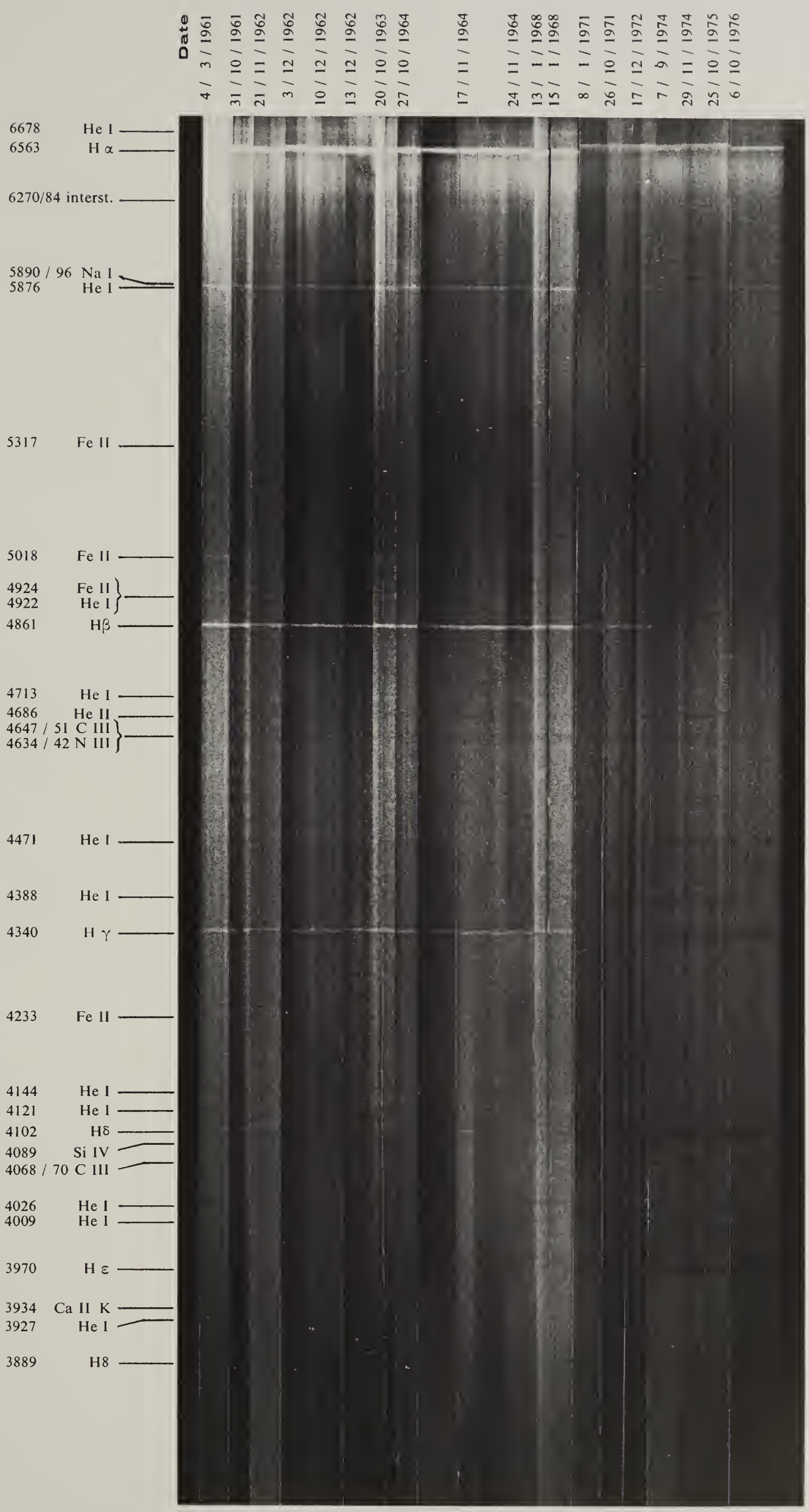
HD 24 534 (1)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17 / 12 / 1972
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6563 H α
6270/84 interst.
5890 / 96 Na I
5876 He I
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5018 Fe II
4924 Fe II
4922 He I
4861 Hβ
4713 He I
4686 He II
4647 / 51 C III
4634 / 42 N III
4471 He I
4388 He I
4340 H γ
4233 Fe II
4144 He I
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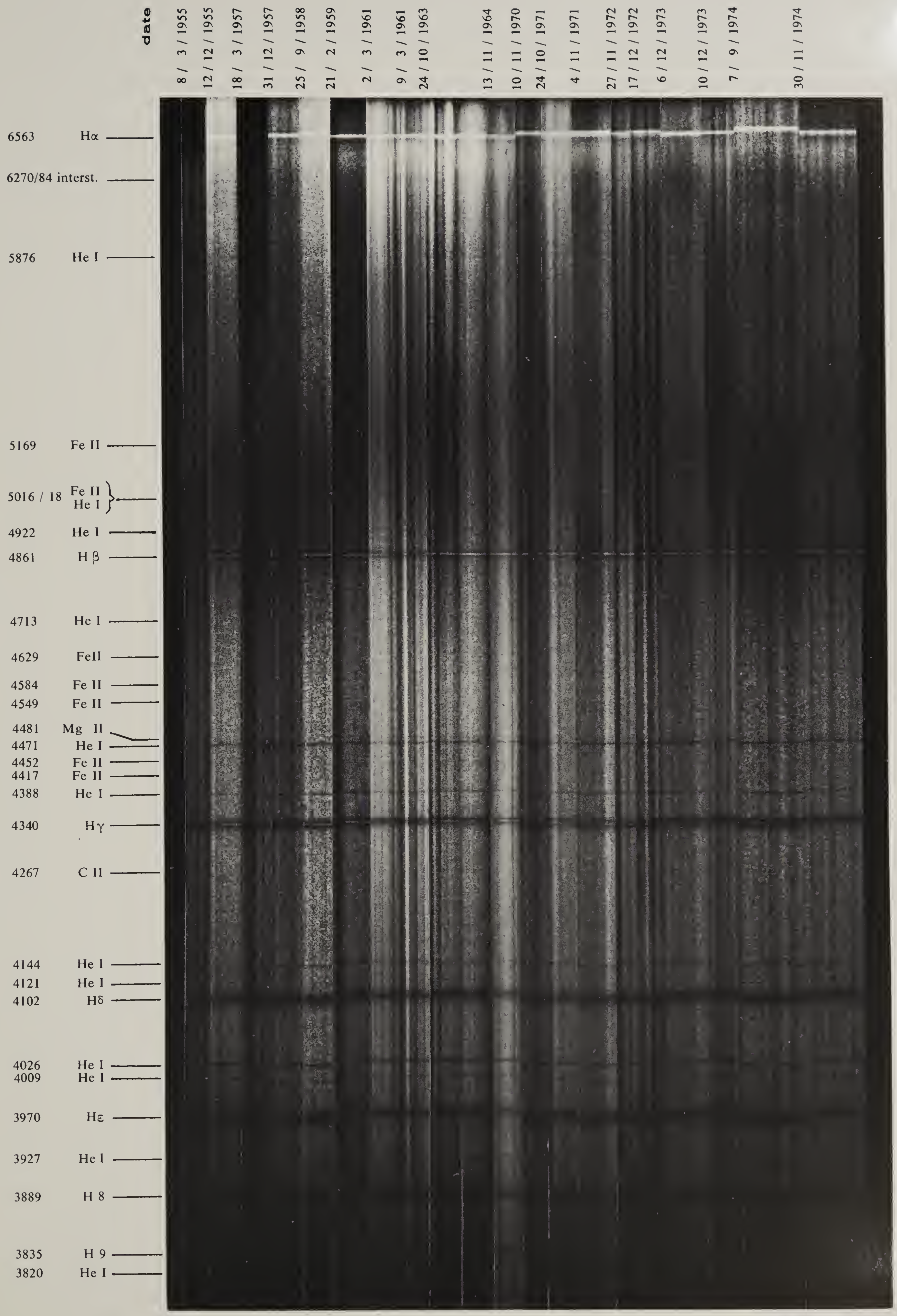
3889 H8

HD 24534 (2)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30 / 11 / 1974
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6270/84 interst.
5876 He I
5169 Fe II
5016 / 18 Fe II He I
4922 He I
4861 H β
4713 He I
4629 FeII
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4549 Fe II
4481 Mg II
4471 He I
4452 Fe II
4417 Fe II
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4340 Hγ
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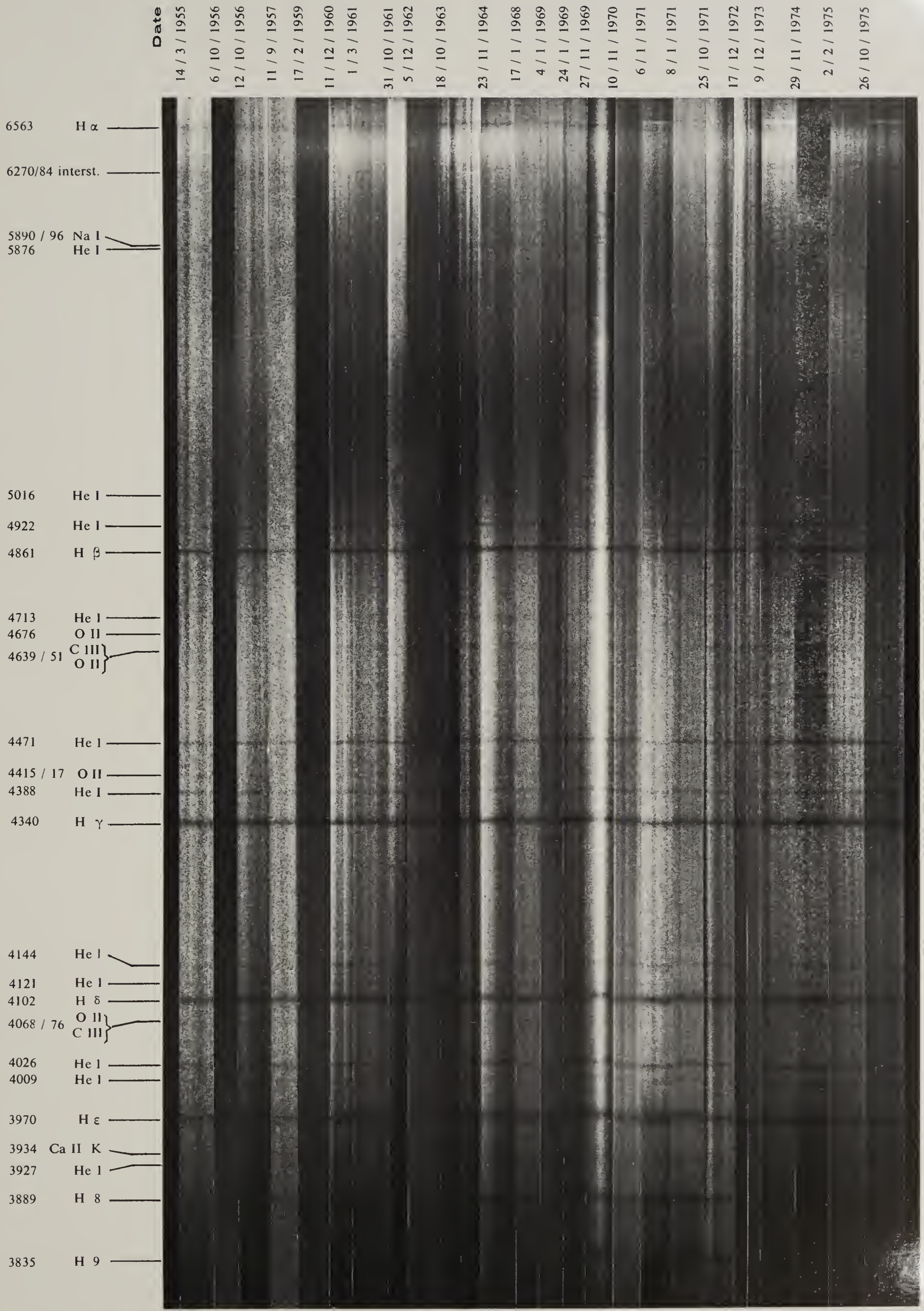
3835 H 9
3820 He I

HD 32 343

HD 33 328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2 / 2 / 1975
26 / 10 / 1975
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6270/84 interst.
5890 / 96 Na I
5876 He I
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4922 He I
4861 H β
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4676 O II
4639 / 51 C III O II
4471 He I
4415 / 17 O II
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4340 H γ
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4121 He I
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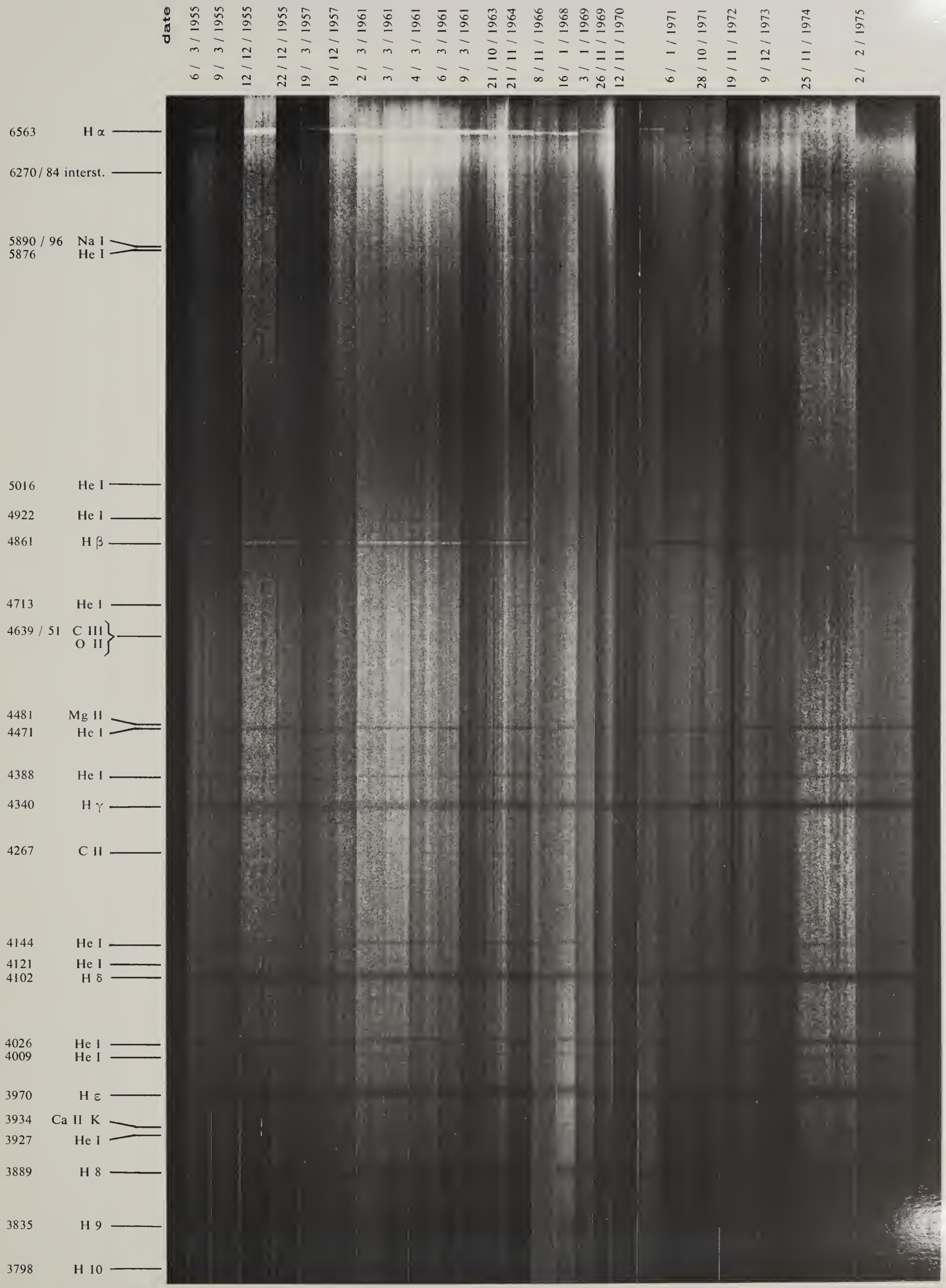
3835 H 9

HD 37657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21 / 11 / 1964
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2 / 2 / 1975
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
5016 He I
4922 He I
4861 H β
4713 He I
4639 / 51 C III O II
4481 Mg II
4471 He I
4388 He I
4340 H γ
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4144 He I
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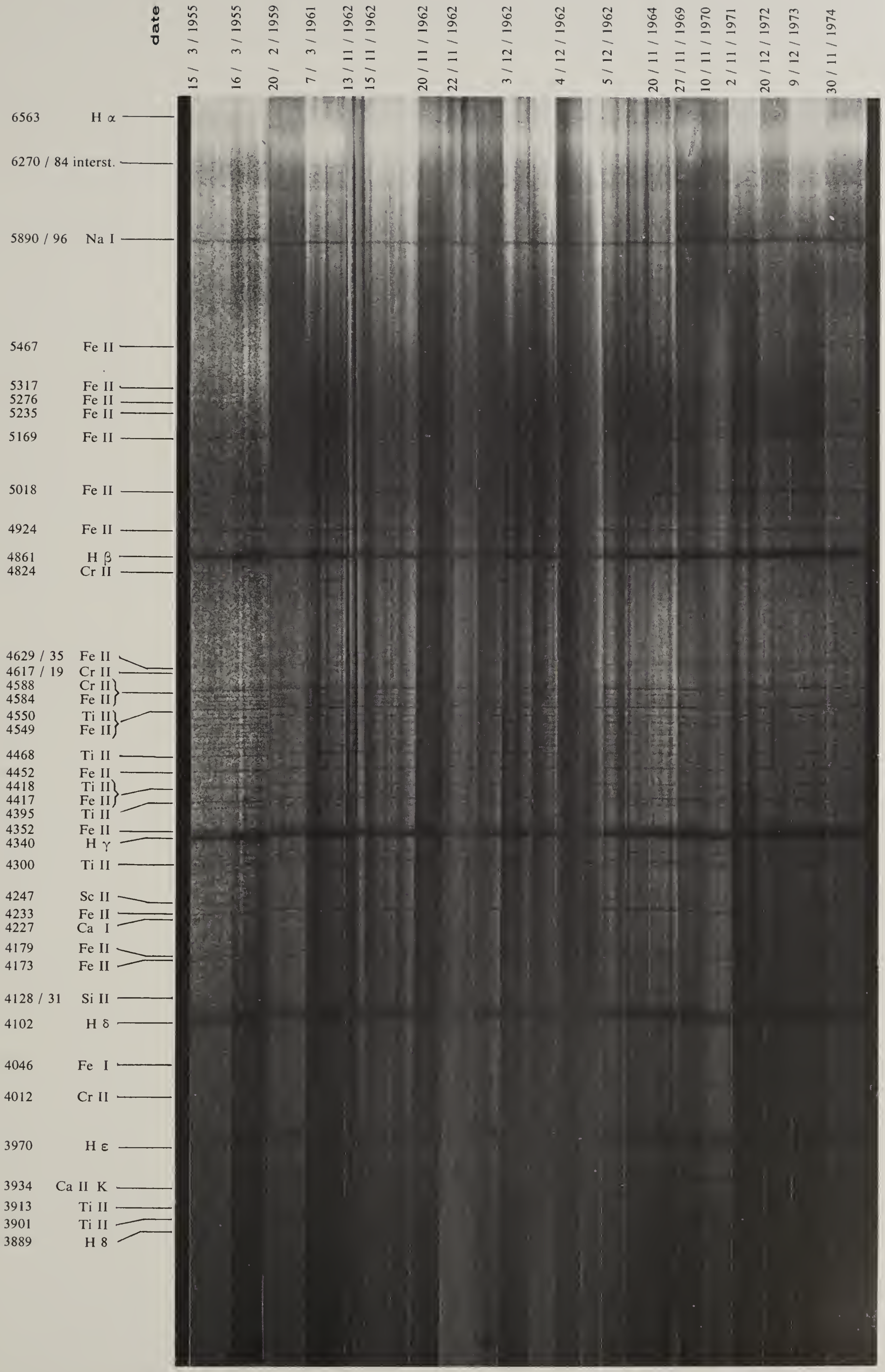
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10 / 11 / 1970
2 / 11 / 1971
20 / 12 / 1972
9 / 12 / 1973
30 / 11 / 1974
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5890 / 96 Na I
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4924 Fe II
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4629 / 35 Fe II
4617 / 19 Cr II
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4340 H γ
4300 Ti II
4247 Sc II
4233 Fe II
4227 Ca I
4179 Fe II
4173 Fe II
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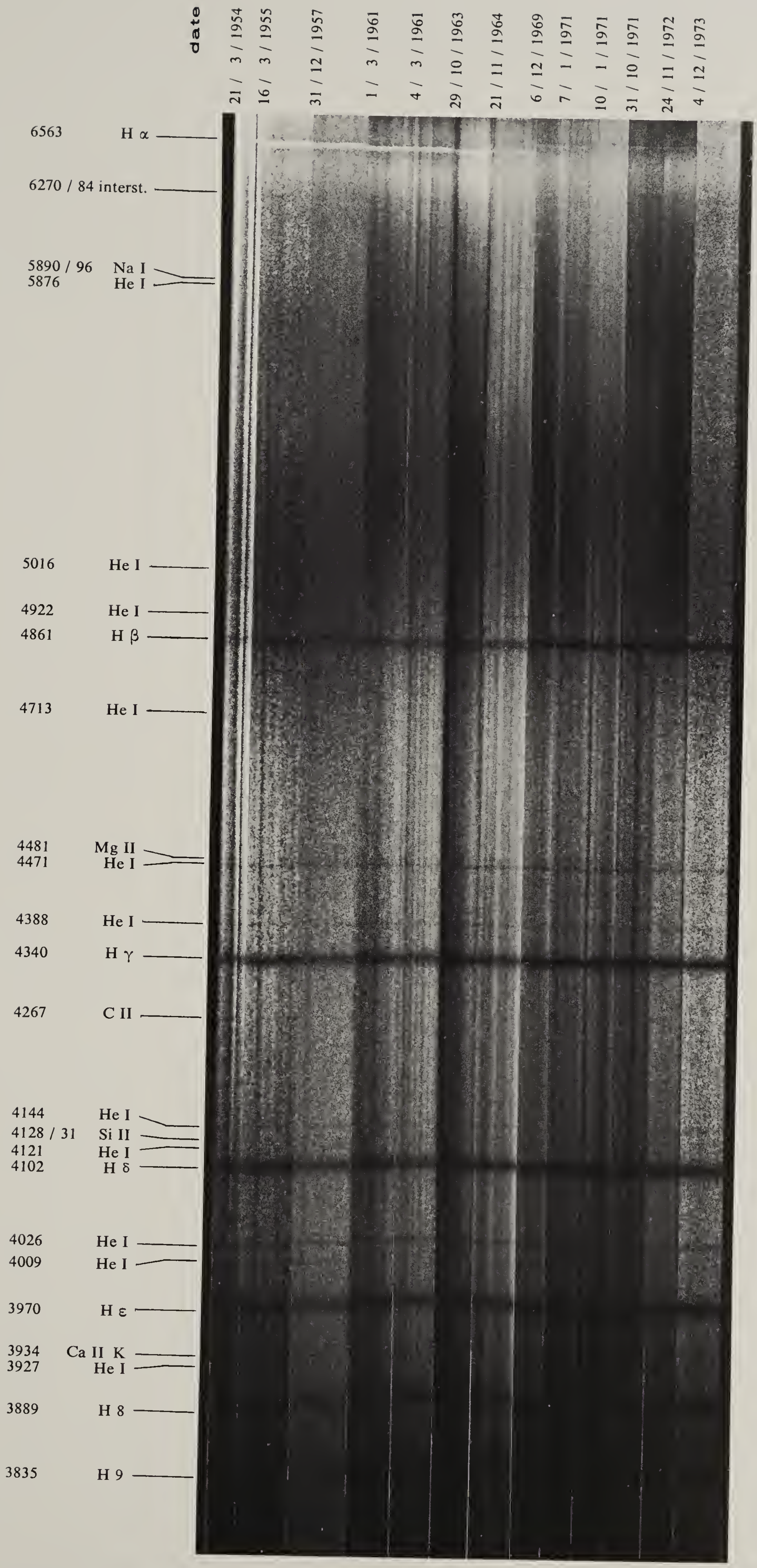
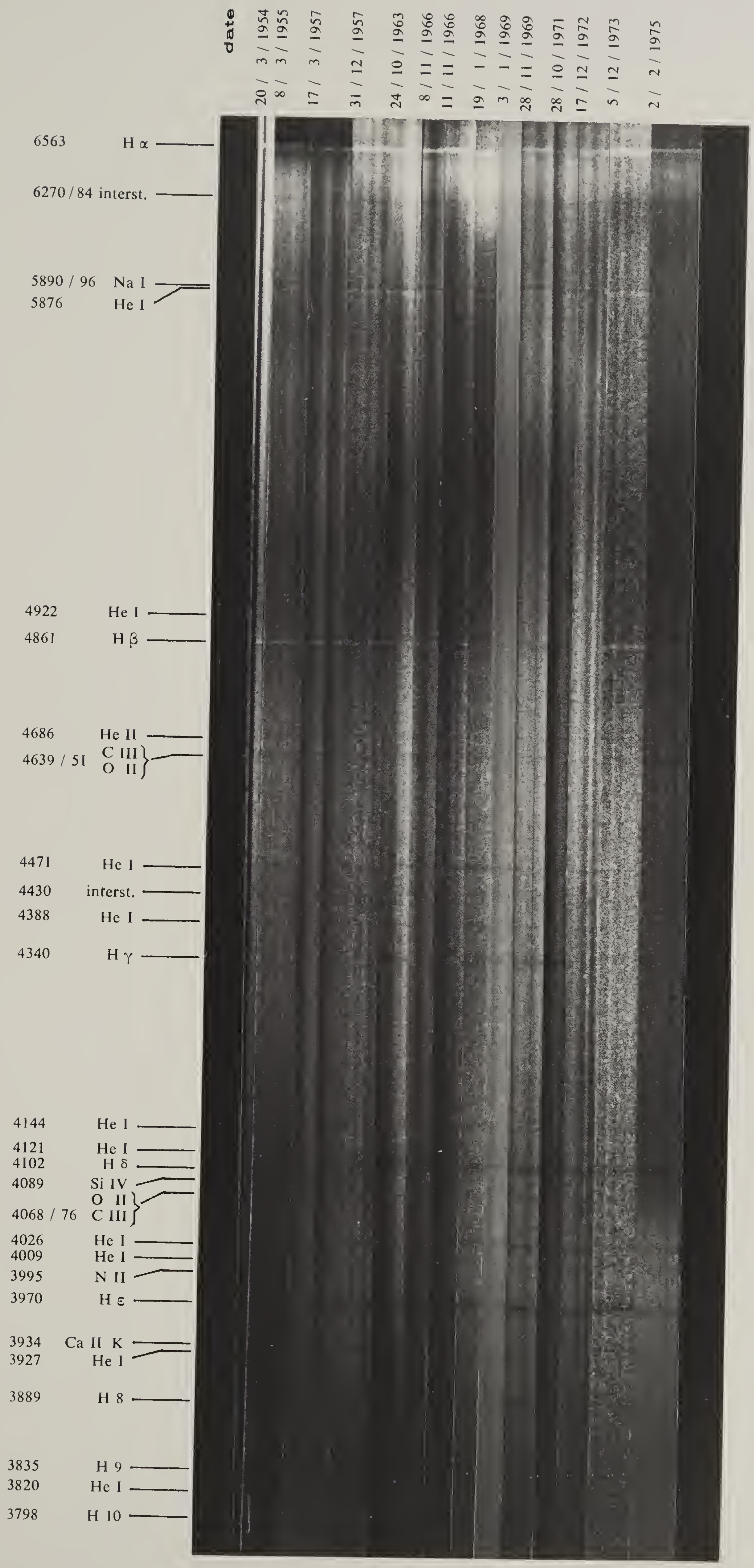
3913 Ti II
3901 Ti II
3889 H 8

HD 41511

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17 / 12 / 1972
5 / 12 / 1973
2 / 2 / 1975
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
4922 He I
4861 H β
4686 He II
4639 / 51 C III O II
4471 He I
4430 interst.
4388 He I
4340 H γ
4144 He I
4121 He I
4102 H δ
4089 Si IV
4068 / 76 O II C III
4026 He I
4009 He I
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3970 H ε
3934 Ca II K
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3889 H 8
3835 H 9
3820 He I
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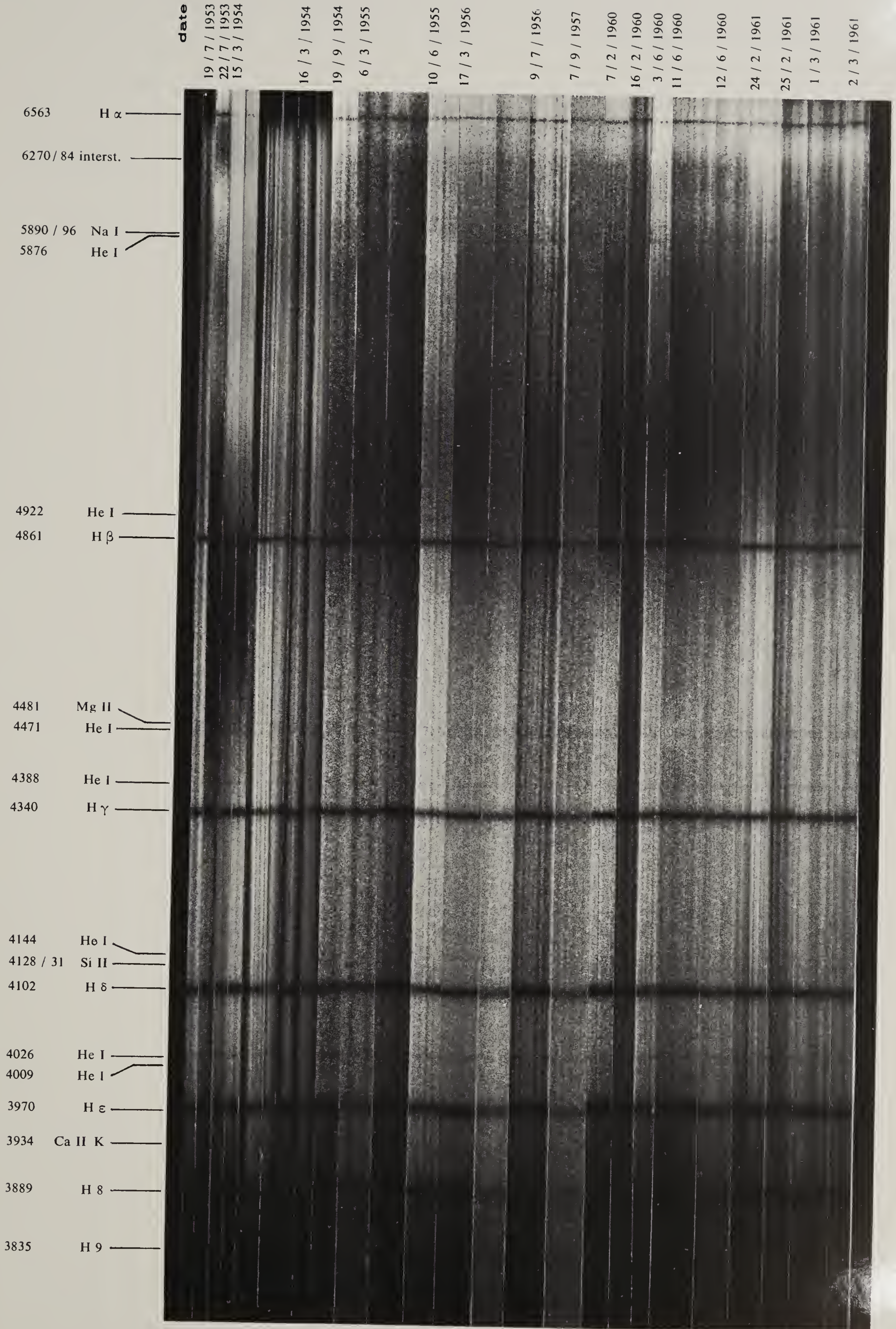
HD 45 314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24 / 2 / 1961
25 / 2 / 1961
1 / 3 / 1961
2 / 3 / 1961
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
4922 He I
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4388 He I
4340 H γ
4144 He I
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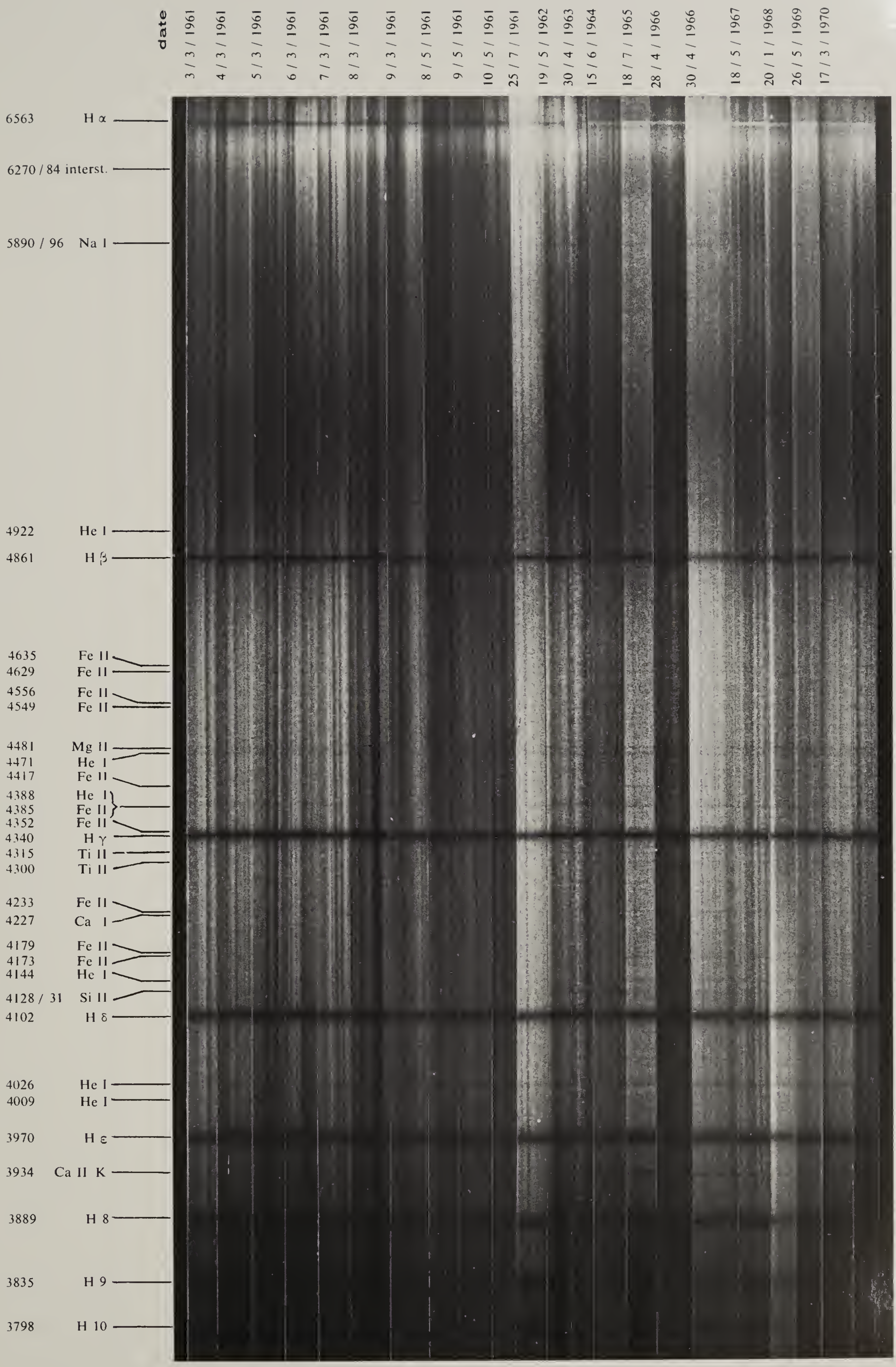
3835 H 9

HD 142926 (1)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6563 H α
6270 / 84 interst.
5890 / 96 Na I
4922 He I
4861 H β
4635 Fe II
4629 Fe II
4556 Fe II
4549 Fe II
4481 Mg II
4471 He I
4417 Fe II
4388 He I
4385 Fe II
4352 Fe II
4340 H γ
4315 Ti II
4300 Ti II
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4227 Ca I
4179 Fe II
4173 Fe II
4144 He I
4128 / 31 Si II
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3970 H ε
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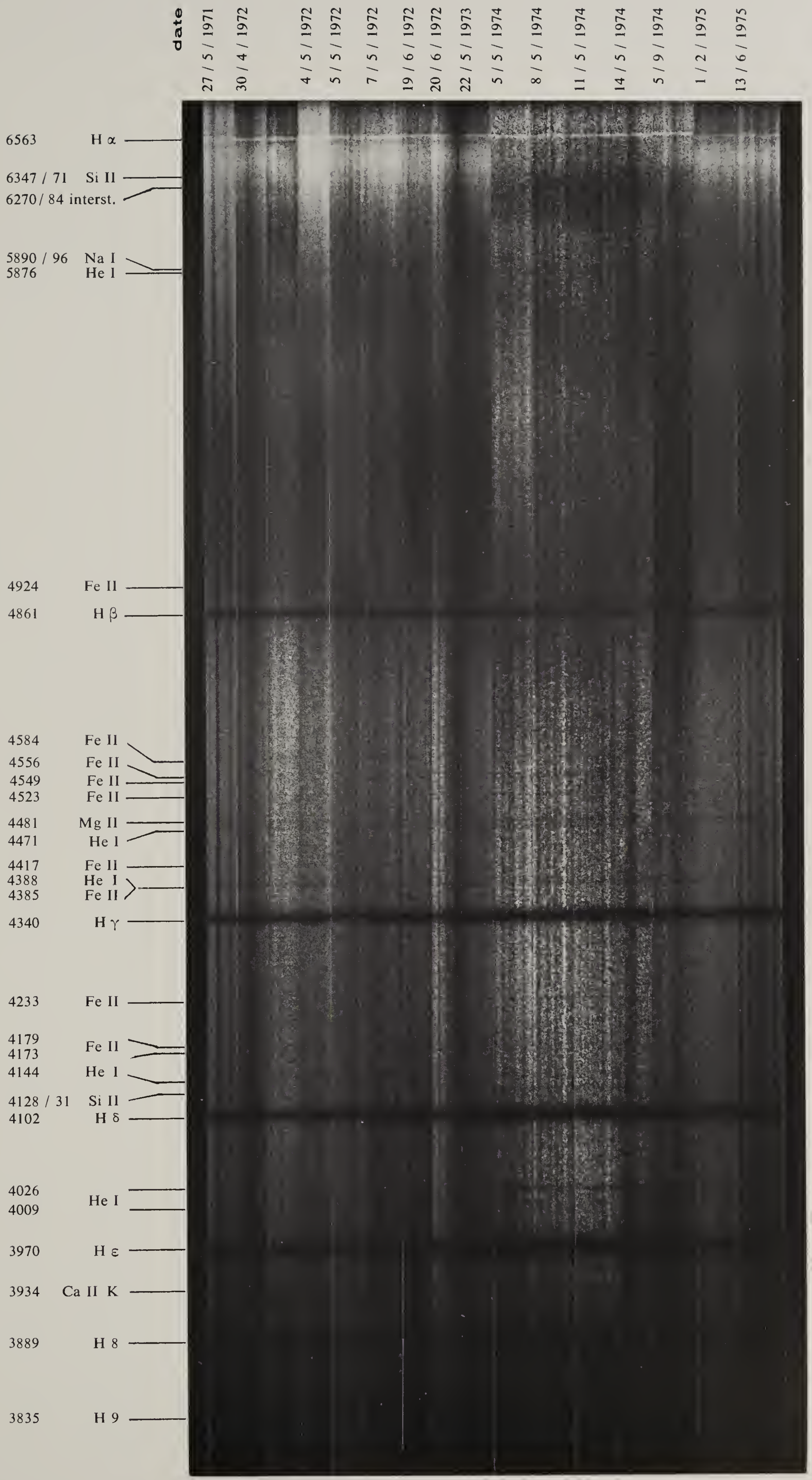
3798 H 10

HD 142 926 (2)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14 / 5 / 1974
5 / 9 / 1974
1 / 2 / 1975
13 / 6 / 1975
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4861 H β
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4523 Fe II
4481 Mg II
4471 He I
4417 Fe II
4388 He I
4385 Fe II
4340 H γ
4233 Fe II
4179
4173 Fe II
4144 He I
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4102 H δ
4026
4009 He I
3970 H ε
3934 Ca II K
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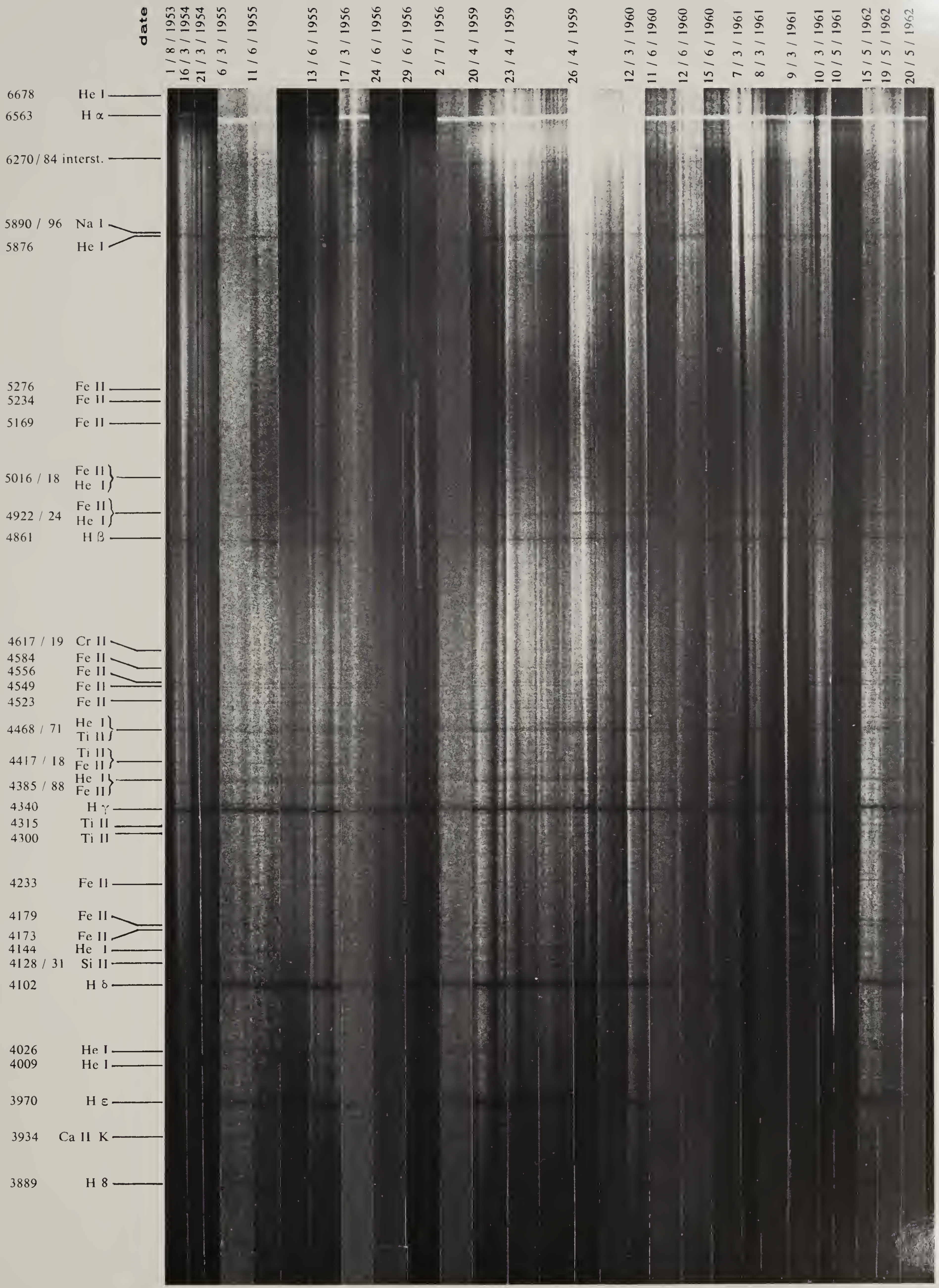
3835 H 9

HD 142 926 (3)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2 / 7 / 1956
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8 / 3 / 1961
9 / 3 / 1961
10 / 3 / 1961
10 / 5 / 1961
15 / 5 / 1962
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20 / 5 / 1962
6678 He I
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
5276 Fe II
5234 Fe II
5169 Fe II
5016 / 18 Fe II He I
4922 / 24 Fe II He I
4861 H β
4617 / 19 Cr II
4584 Fe II
4556 Fe II
4549 Fe II
4523 Fe II
4468 / 71 He I Ti II
4417 / 18 Ti II Fe II
4385 / 88 He I Fe II
4340 H γ
4315 Ti II
4300 Ti II
4233 Fe II
4179 Fe II
4173 Fe II
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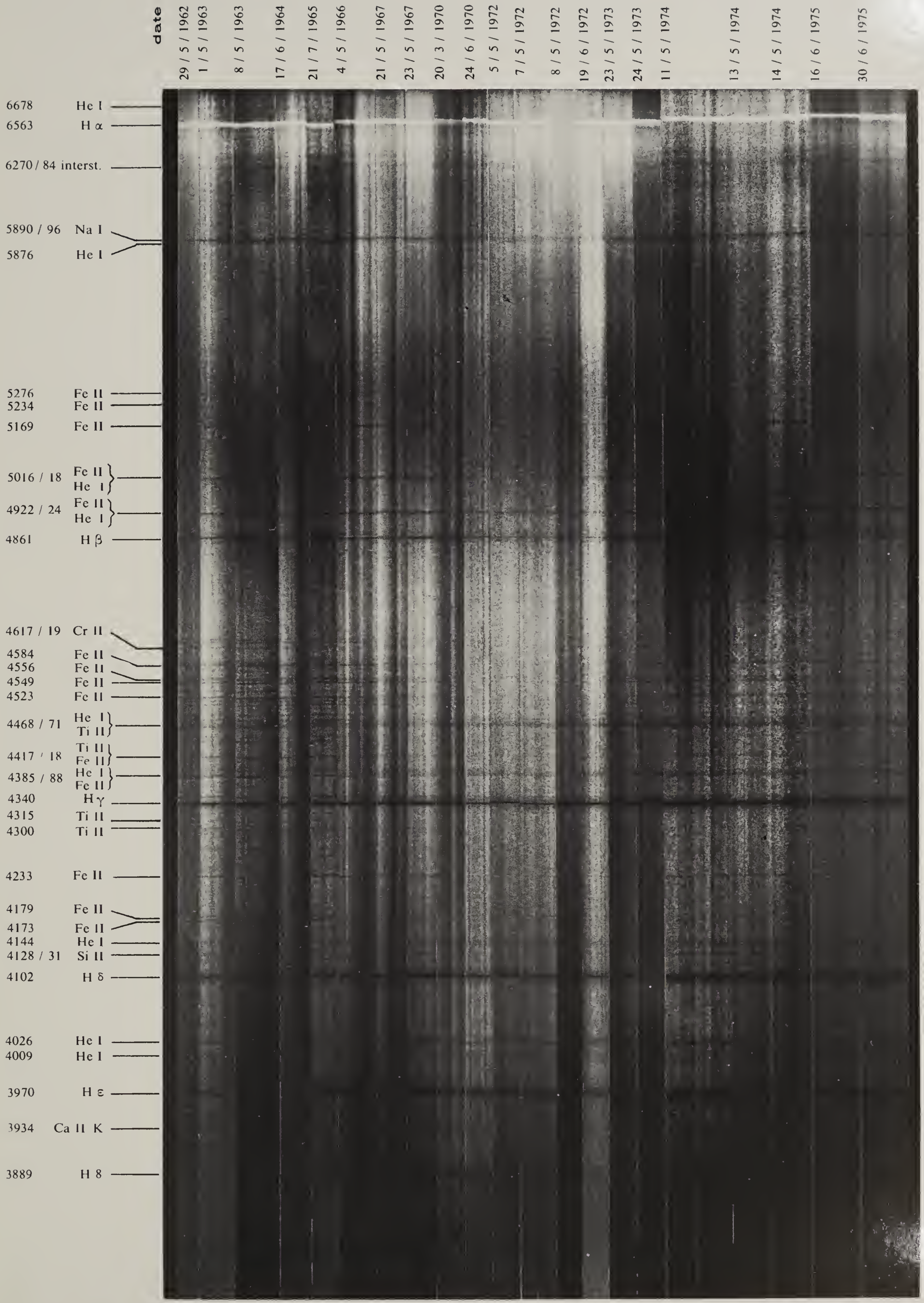
3889 H 8

HD 142983 (1)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6563 H α
6270 / 84 interst.
5890 / 96 Na I
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5276 Fe II
5234 Fe II
5169 Fe II
5016 / 18 Fe II He I
4922 / 24 Fe II He I
4861 H β
4617 / 19 Cr II
4584 Fe II
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4549 Fe II
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4385 / 88 He I Fe II
4340 H γ
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4300 Ti II
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4173 Fe II
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4102 H δ
4026 He I
4009 He I
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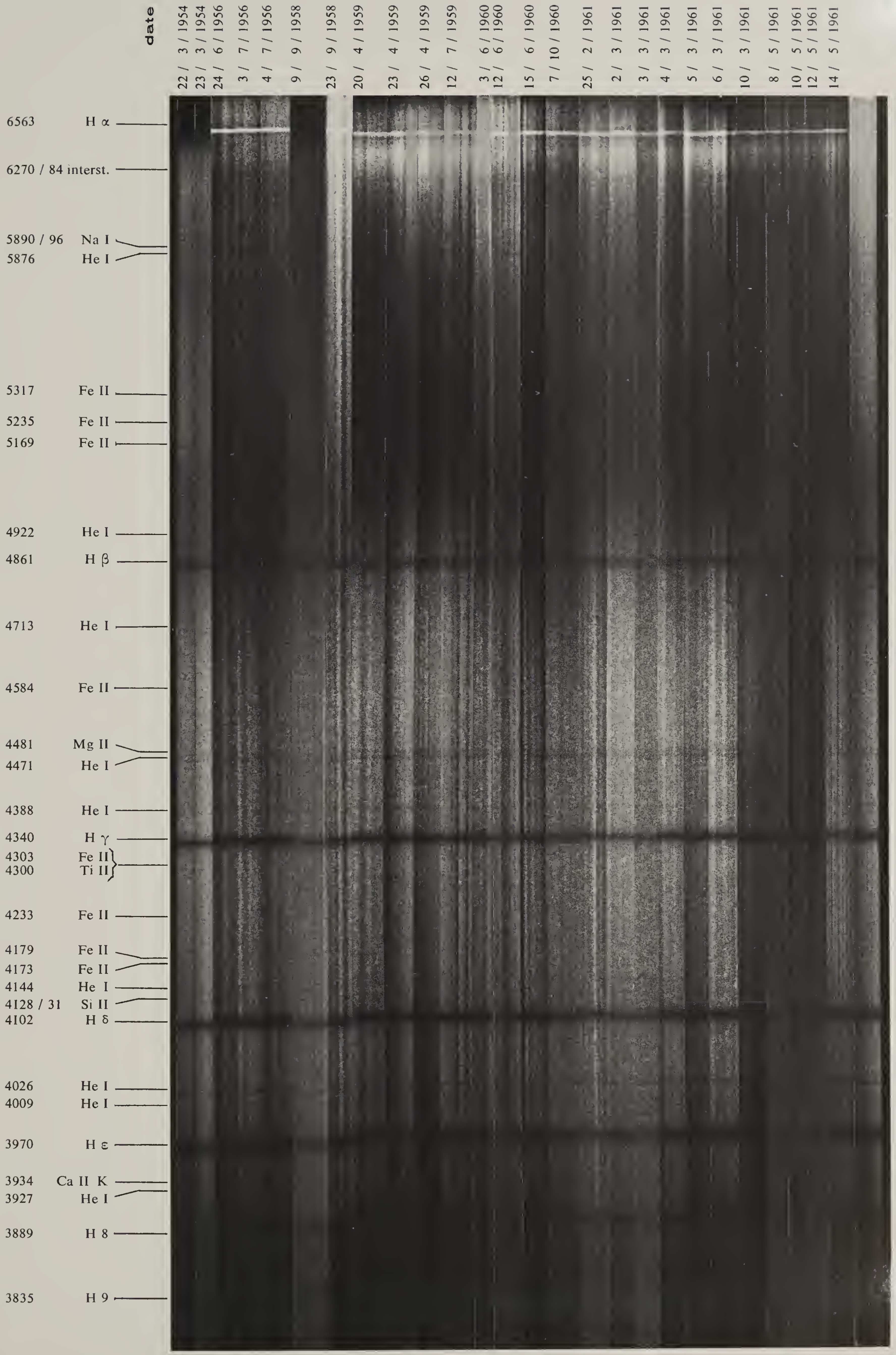
3934 Ca II K
3889 H 8

HD 142 983 (2)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6270 / 84 interst.
5890 / 96 Na I
5876 He I
5317 Fe II
5235 Fe II
5169 Fe II
4922 He I
4861 H β
4713 He I
4584 Fe II
4481 Mg II
4471 He I
4388 He I
4340 H γ
4303 Fe II
4300 Ti II
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4179 Fe II
4173 Fe II
4144 He I
4128 / 31 Si II
4102 H δ
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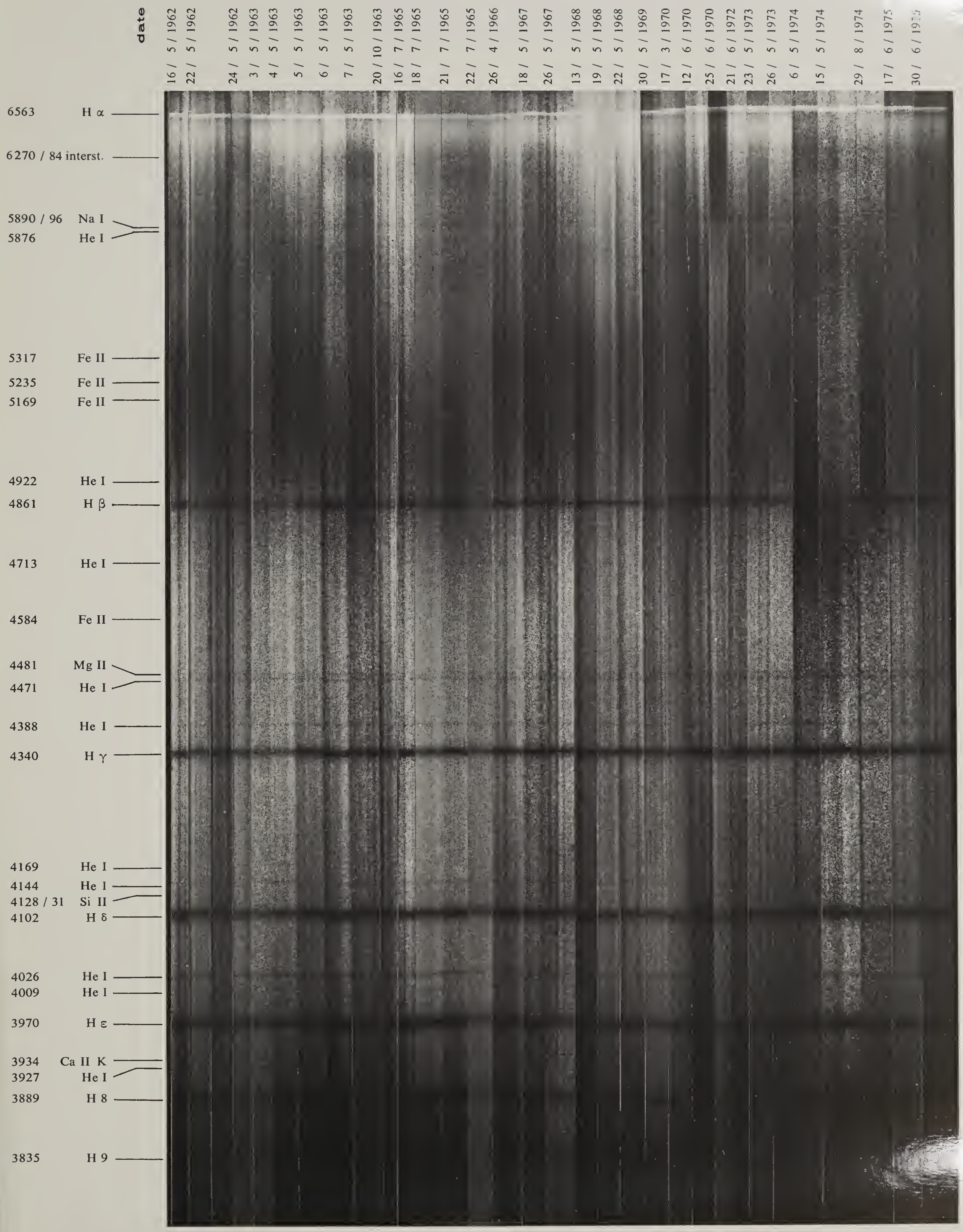
3889 H 8
3835 H 9

HD 162 428 (1)

HD 162 428 (2)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30 / 6 / 1975
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
5317 Fe II
5235 Fe II
5169 Fe II
4922 He I
4861 H β
4713 He I
4584 Fe II
4481 Mg II
4471 He I
4388 He I
4340 H γ
4169 He I
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4009 He I
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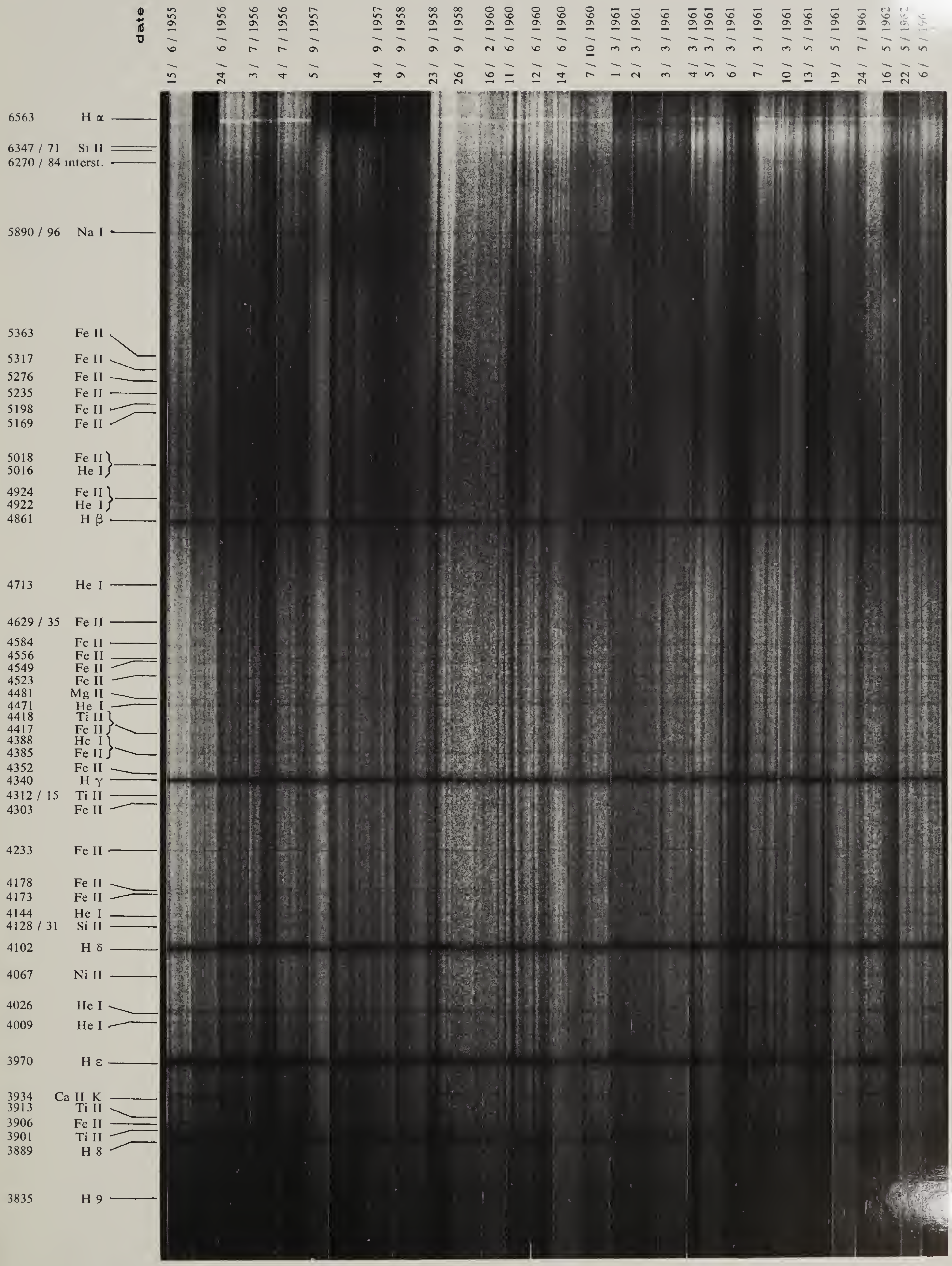
3835 H 9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13 / 5 / 1961
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6 / 5 / 196
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6347 / 71 Si II
6270 / 84 interst.
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5317 Fe II
5276 Fe II
5235 Fe II
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5018 Fe II
5016 He I
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4922 He I
4861 H β
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4629 / 35 Fe II
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4523 Fe II
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4418 Ti II
4417 Fe II
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4385 Fe II
4352 Fe II
4340 H γ
4312 / 15 Ti II
4303 Fe II
4233 Fe II
4178 Fe II
4173 Fe II
4144 He I
4128 / 31 Si II
4102 H δ
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4026 He I
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3970 H ε
3934 Ca II K
3913 Ti II
3906 Fe II
3901 Ti II
3889 H 8
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HD 162 732 (1)

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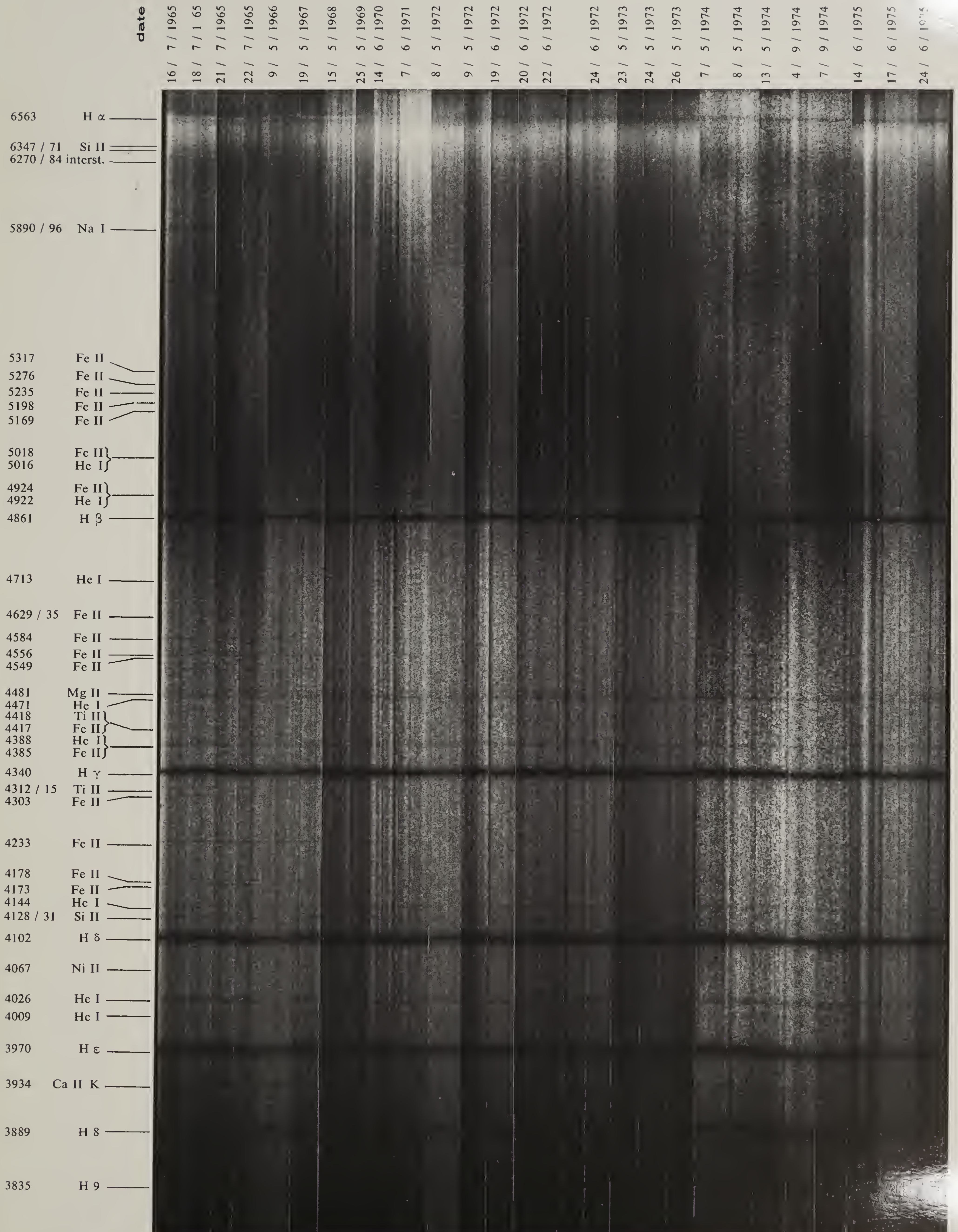
PHYSICS

HD 162 732 (2)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7 / 9 / 1974
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17 / 6 / 1975
24 / 6 / 1975
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6347 / 71 Si II
6270 / 84 interst.
5890 / 96 Na I
5317 Fe II
5276 Fe II
5235 Fe II
5198 Fe II
5169 Fe II
5018 Fe II
5016 He I
4924 Fe II
4922 He I
4861 H β
4713 He I
4629 / 35 Fe II
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4481 Mg II
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4388 He I
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4340 H γ
4312 / 15 Ti II
4303 Fe II
4233 Fe II
4178 Fe II
4173 Fe II
4144 He I
4128 / 31 Si II
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4026 He I
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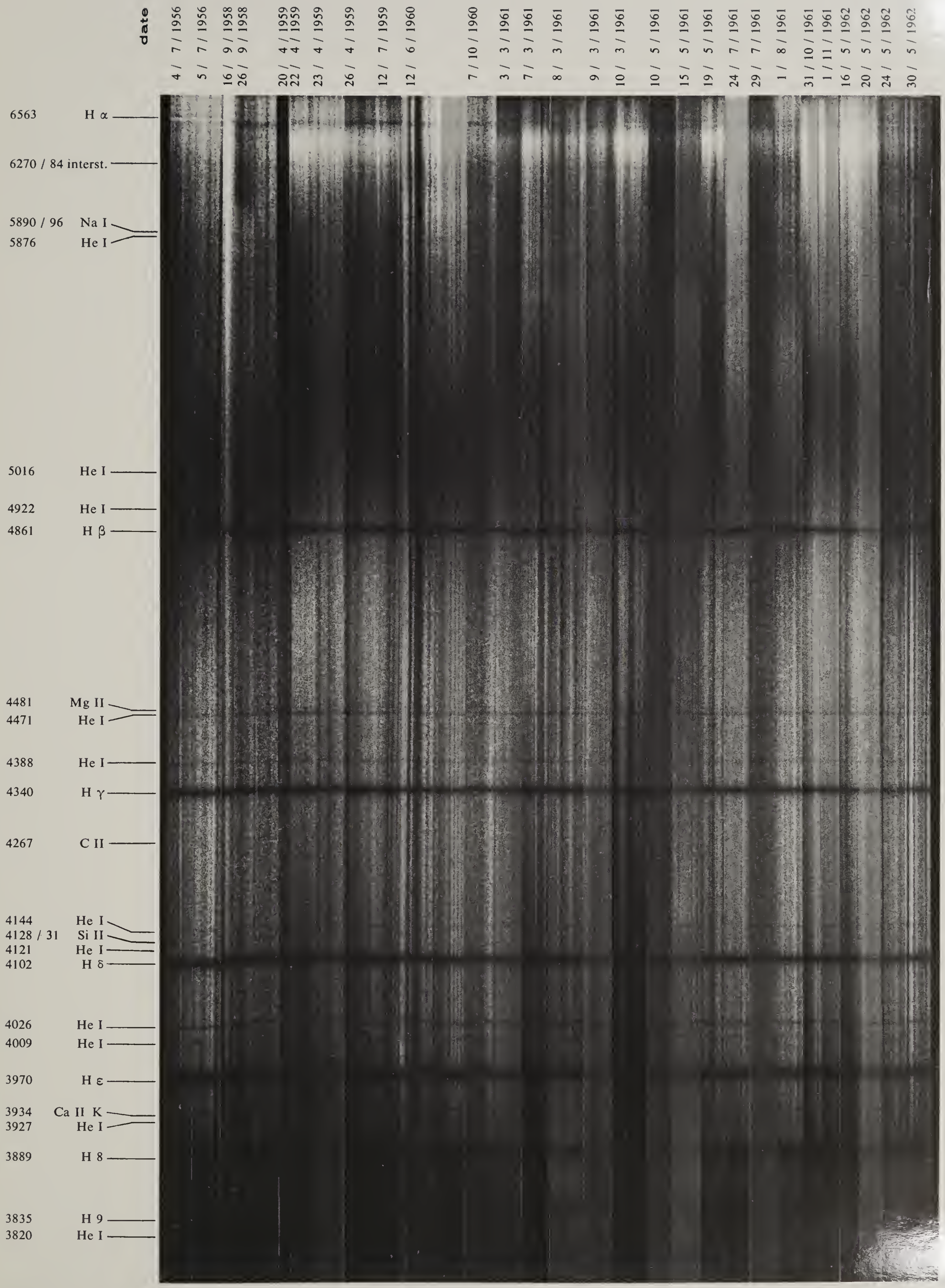
3835 H 9

HD 171 406 (1)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16 / 5 / 1962
20 / 5 / 1962
24 / 5 / 1962
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5890 / 96 Na I
5876 He I
5016 He I
4922 He I
4861 H β
4481 Mg II
4471 He I
4388 He I
4340 H γ
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4144 He I
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3889 H 8
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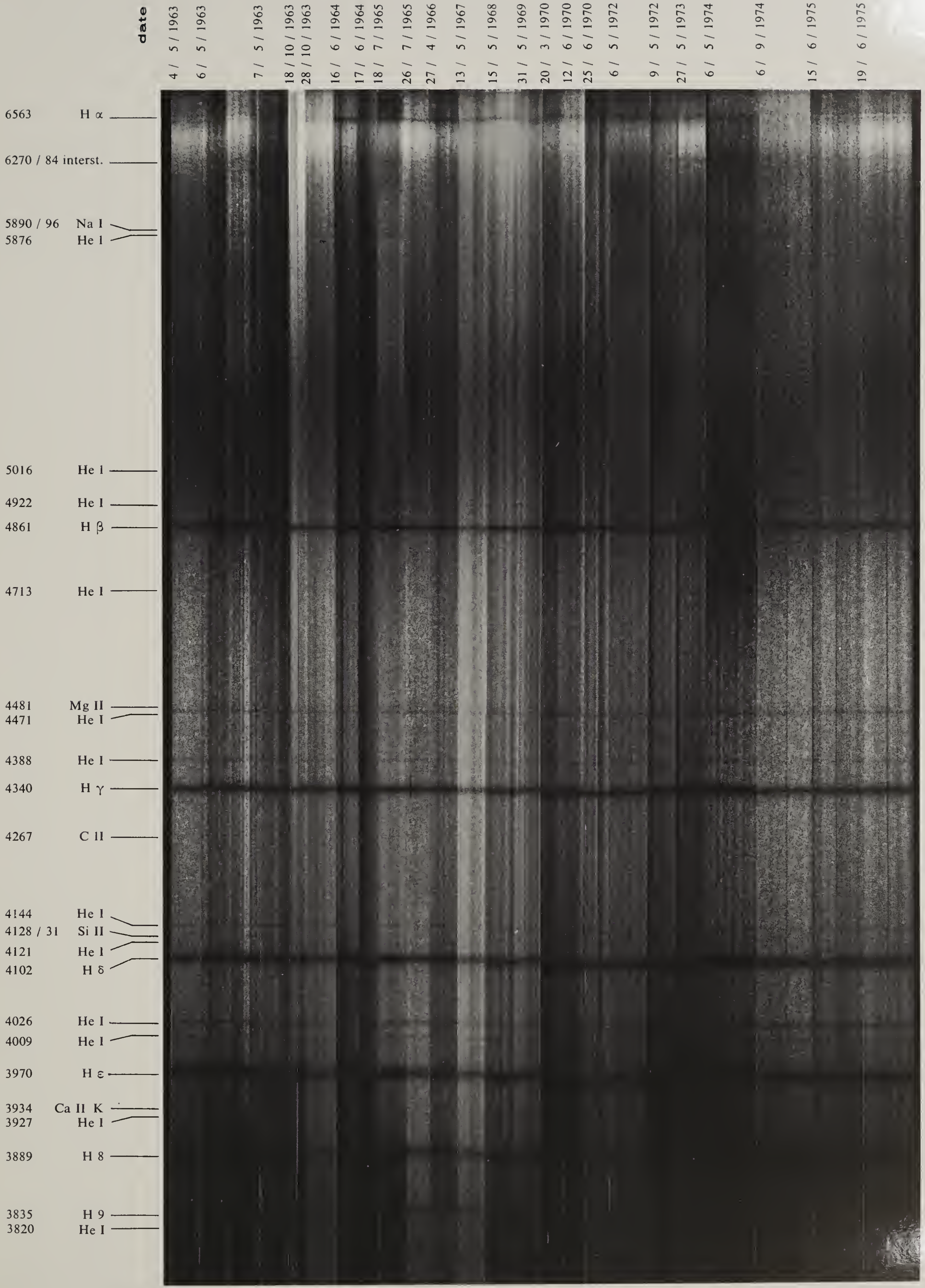
3820 He I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6270 / 84 interst.
5890 / 96 Na I
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5016 He I
4922 He I
4861 H β
4713 He I
4481 Mg II
4471 He I
4388 He I
4340 H γ
4267 C II
4144 He I
4128 / 31 Si II
4121 He I
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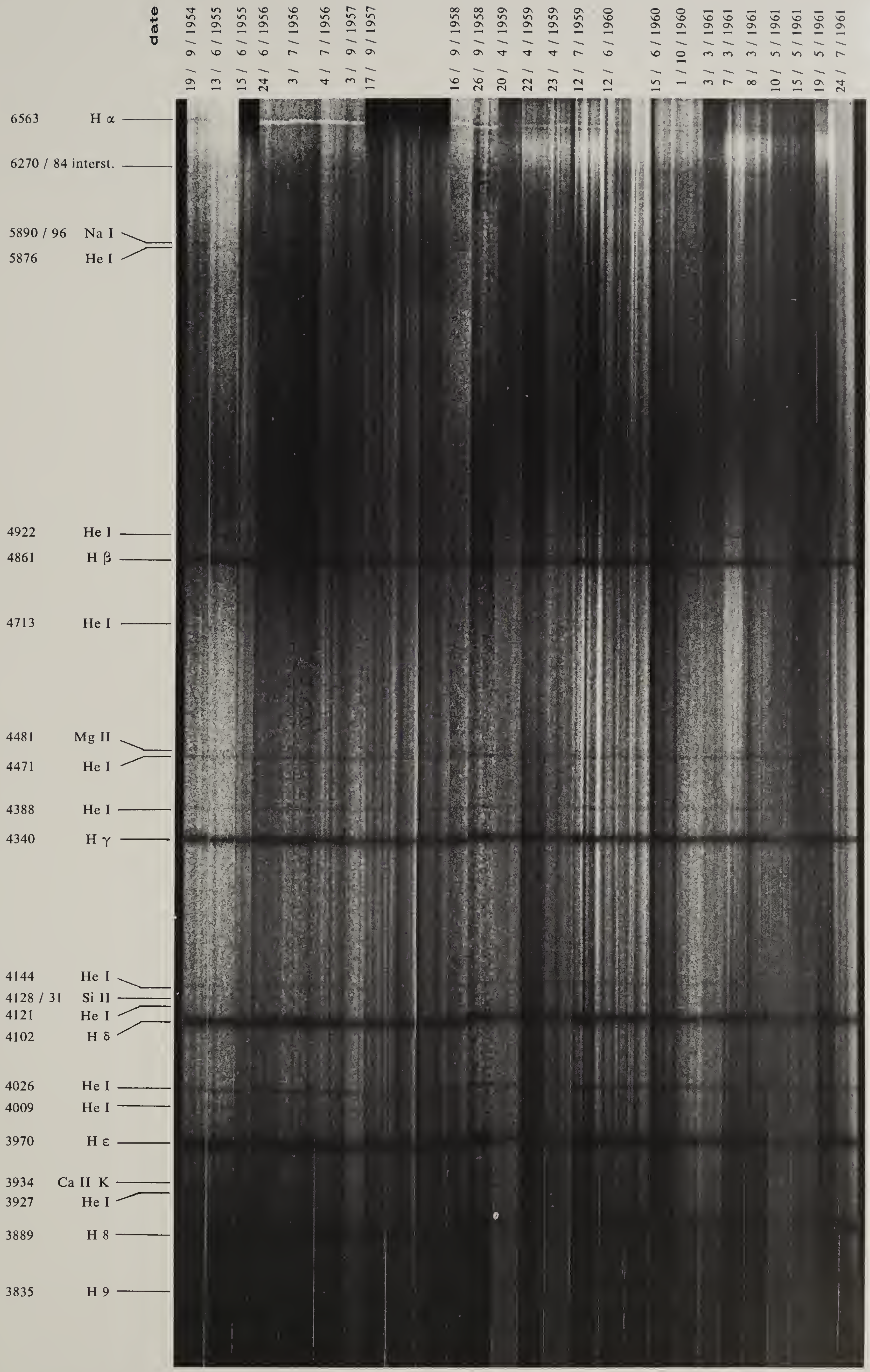
3820 He I

HD 171 406 (2)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19 / 5 / 1961
24 / 7 / 1961
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6270 / 84 interst.
5890 / 96 Na I
5876 He I
4922 He I
4861 H β
4713 He I
4481 Mg II
4471 He I
4388 He I
4340 H γ
4144 He I
4128 / 31 Si II
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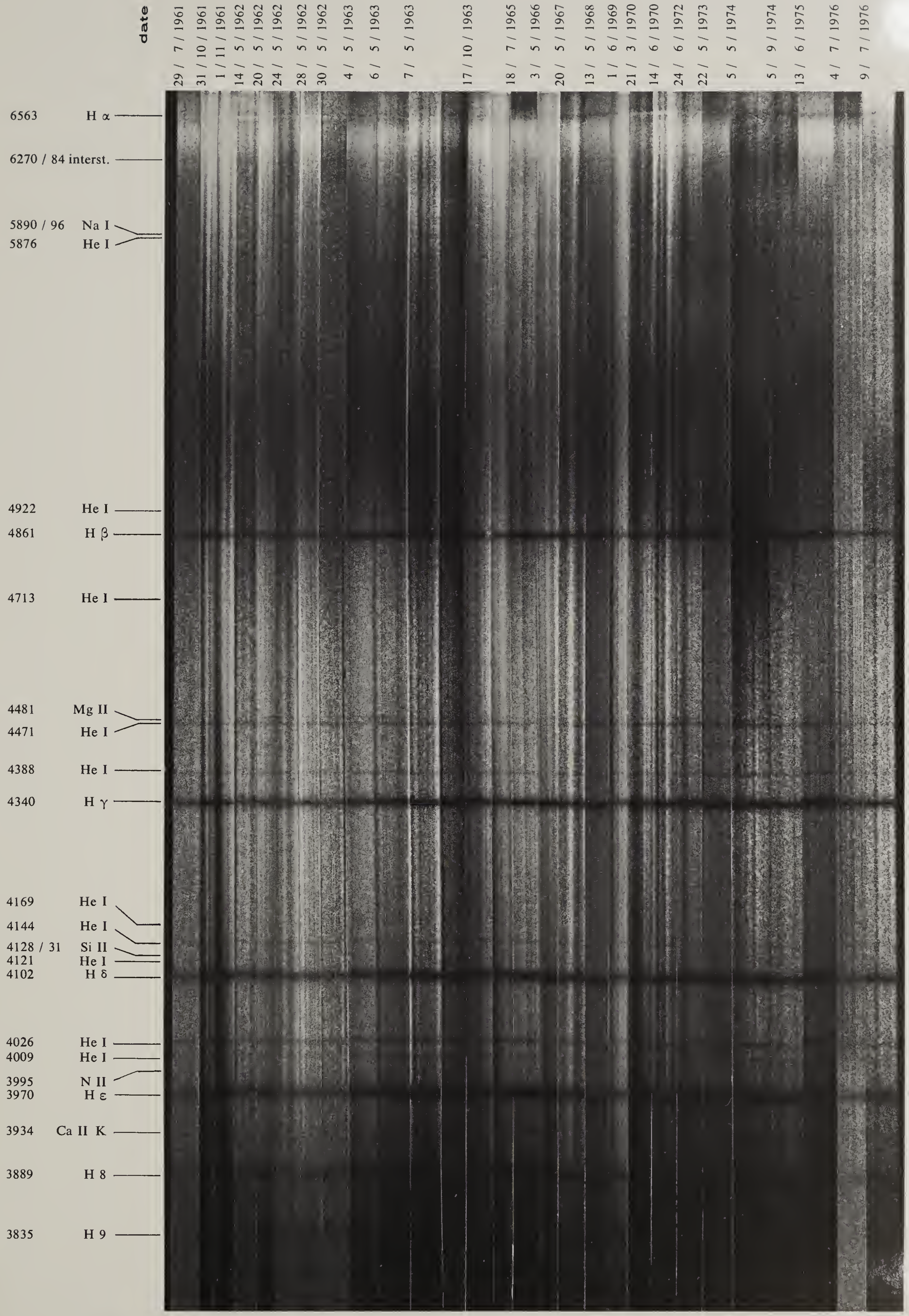
3835 H 9

HD 171 780 (1)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5890 / 96 Na I
5876 He I
4922 He I
4861 H β
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4471 He I
4388 He I
4340 H γ
4169 He I
4144 He I
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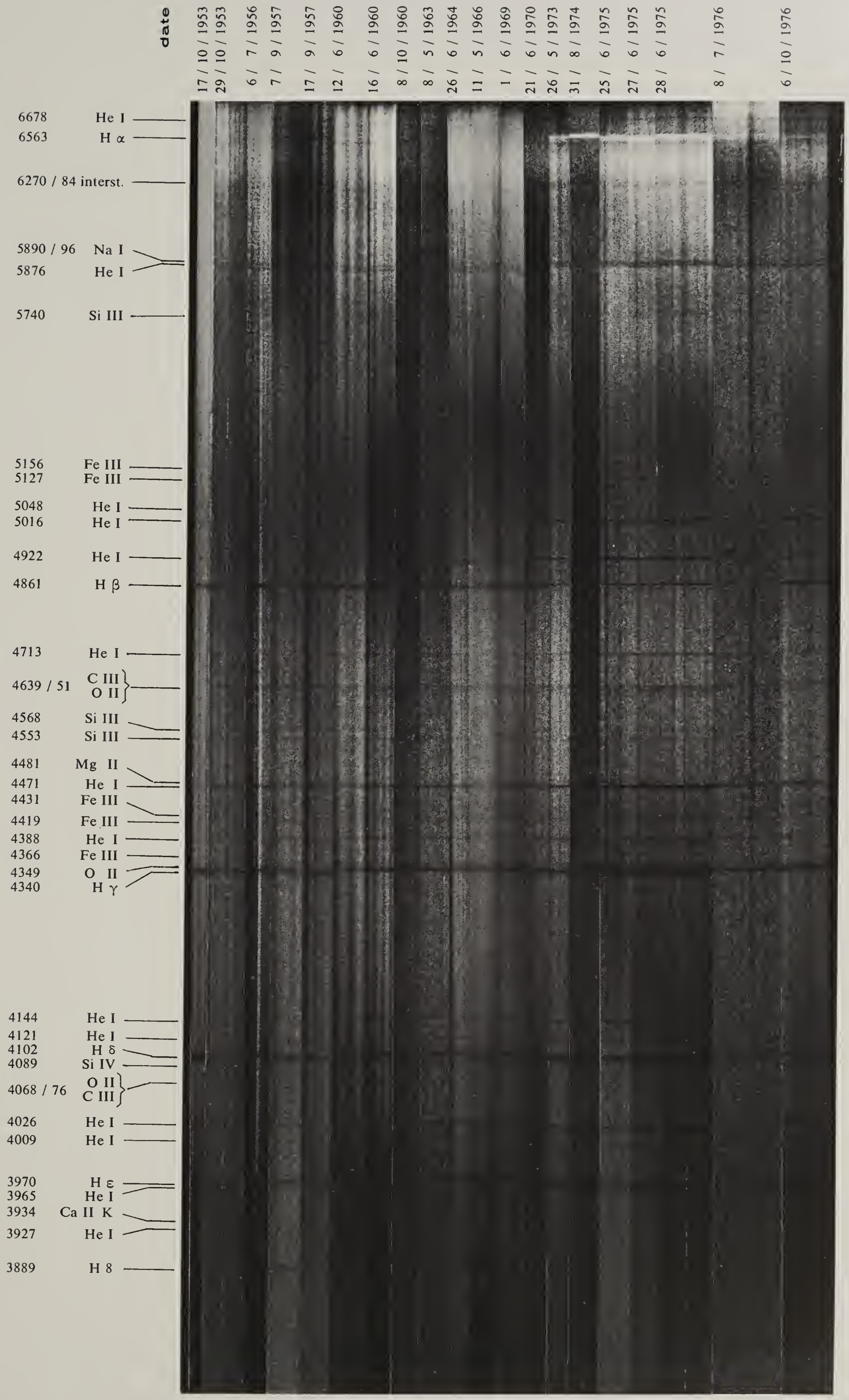
3835 H 9

HD 171 780 (2)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5890 / 96 Na I
5876 He I
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5156 Fe III
5127 Fe III
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5016 He I
4922 He I
4861 H β
4713 He I
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4471 He I
4431 Fe III
4419 Fe III
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4366 Fe III
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4144 He I
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4102 H δ
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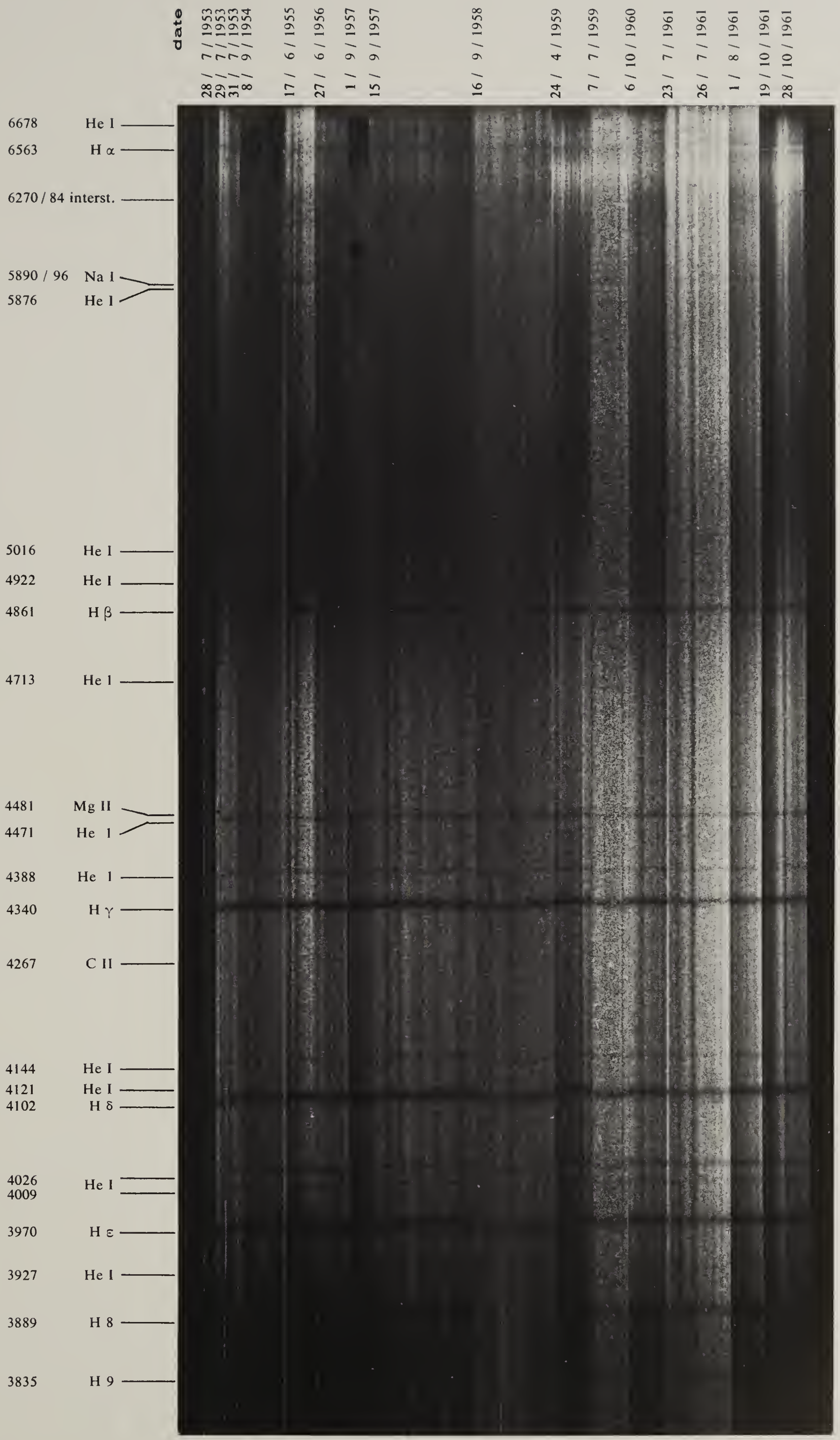
3927 He I
3889 H 8

HD 184 279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6 / 10 / 1960
23 / 7 / 1961
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1 / 8 / 1961
19 / 10 / 1961
28 / 10 / 1961
6678 He I
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
5016 He I
4922 He I
4861 H β
4713 He I
4481 Mg II
4471 He I
4388 He I
4340 H γ
4267 C II
4144 He I
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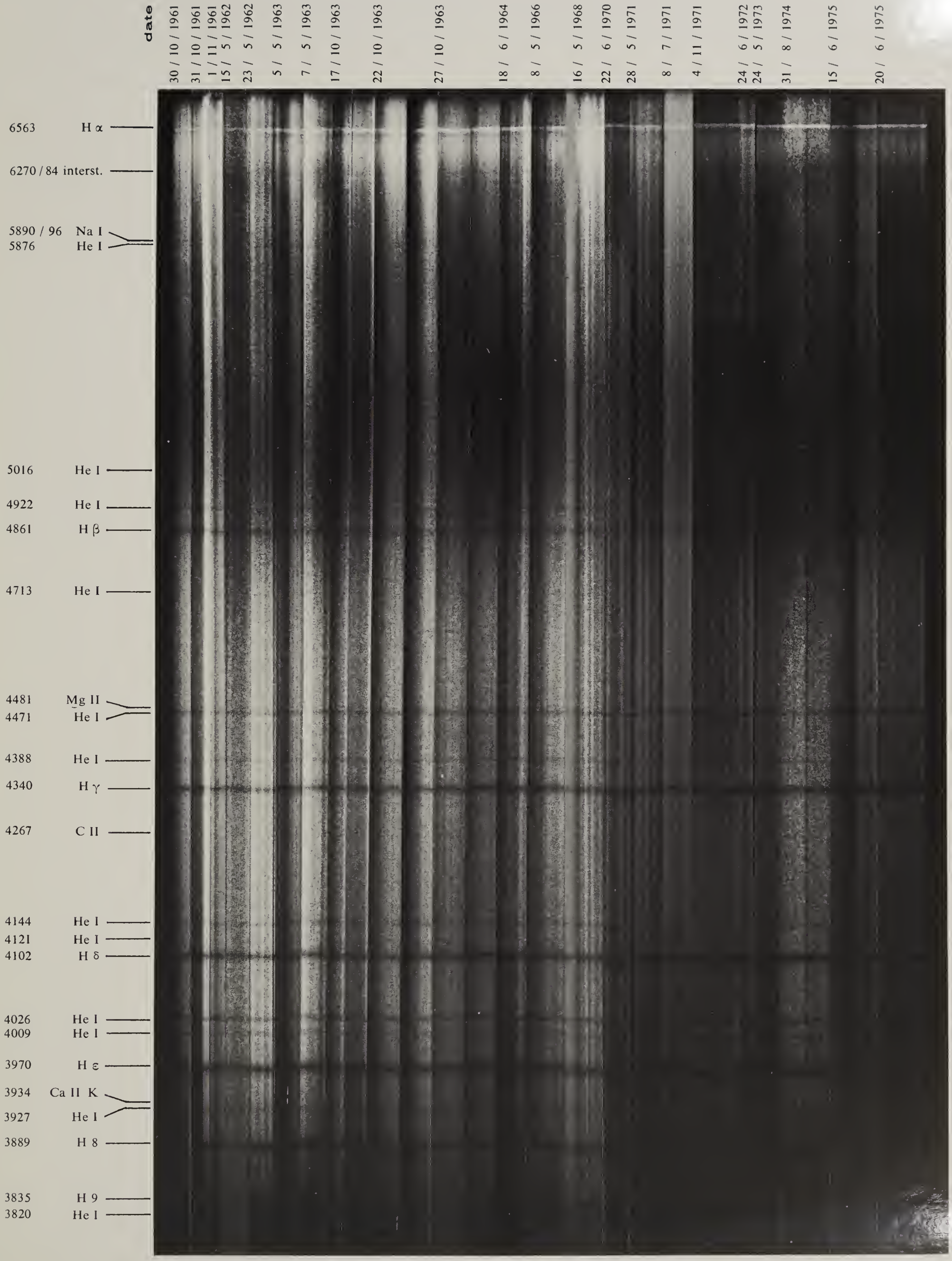
4026 He I
4009
3970 H ε
3927 He I
3889 H 8
3835 H 9

HD 191610 (1)

HD 191 610 (2)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24 / 5 / 1973
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15 / 6 / 1975
20 / 6 / 1975
6563 H α
6270 / 84 interst.
5890 / 96 Na I
5876 He I
5016 He I
4922 He I
4861 H β
4713 He I
4481 Mg II
4471 He I
4388 He I
4340 H γ
4267 C II
4144 He I
4121 He I
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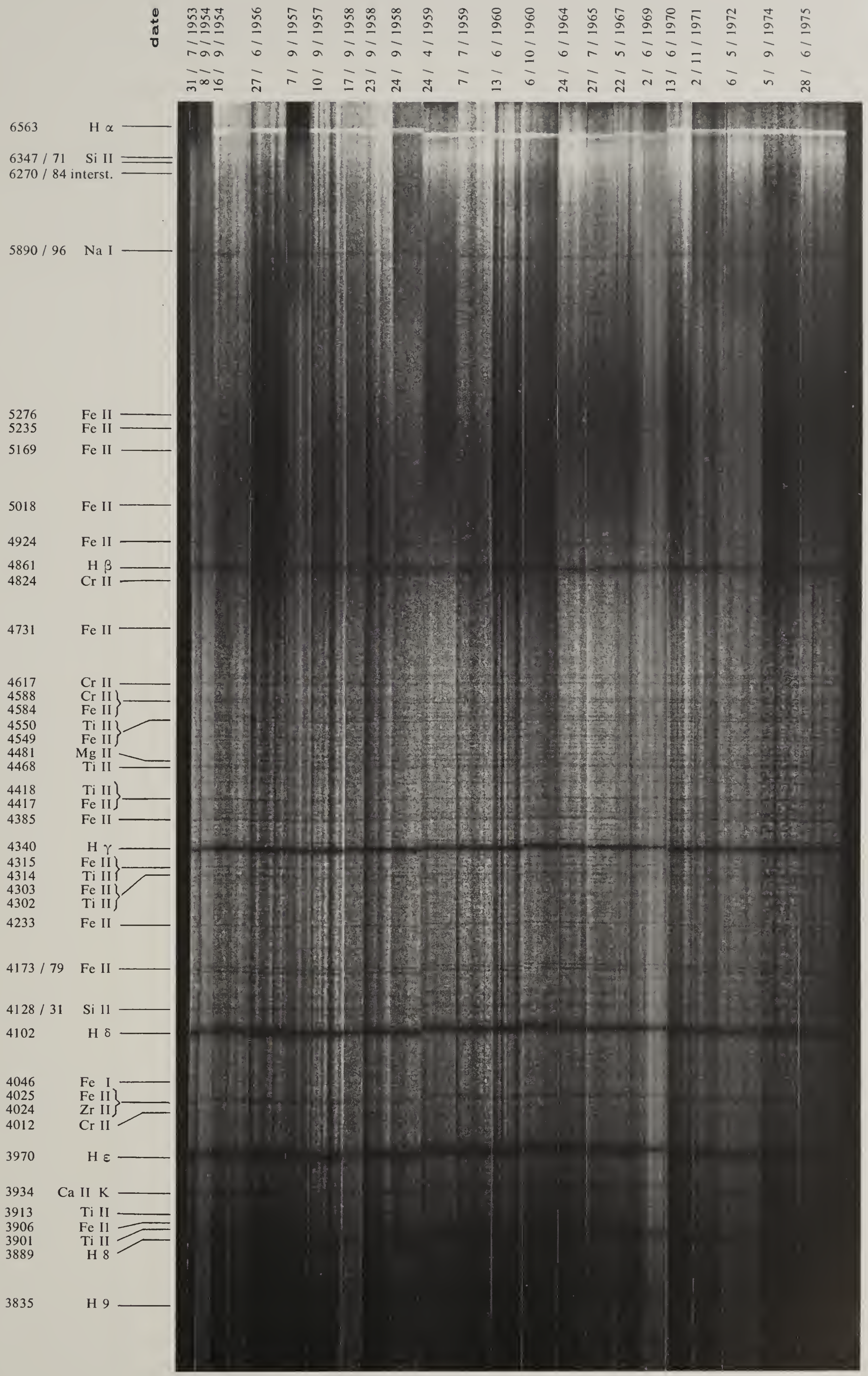
3835 H 9
3820 He I

HD 193182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2 / 6 / 1969
13 / 6 / 1970
2 / 11 / 1971
6 / 5 / 1972
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28 / 6 / 1975
6563 H α
6347 / 71 Si II
6270 / 84 interst.
5890 / 96 Na I
5276 Fe II
5235 Fe II
5169 Fe II
5018 Fe II
4924 Fe II
4861 H β
4824 Cr II
4731 Fe II
4617 Cr II
4588 Cr II
4584 Fe II
4550 Ti II
4549 Fe II
4481 Mg II
4468 Ti II
4418 Ti II
4417 Fe II
4385 Fe II
4340 H γ
4315 Fe II
4314 Ti II
4303 Fe II
4302 Ti II
4233 Fe II
4173 / 79 Fe II
4128 / 31 Si II
4102 H δ
4046 Fe I
4025 Fe II
4024 Zr II
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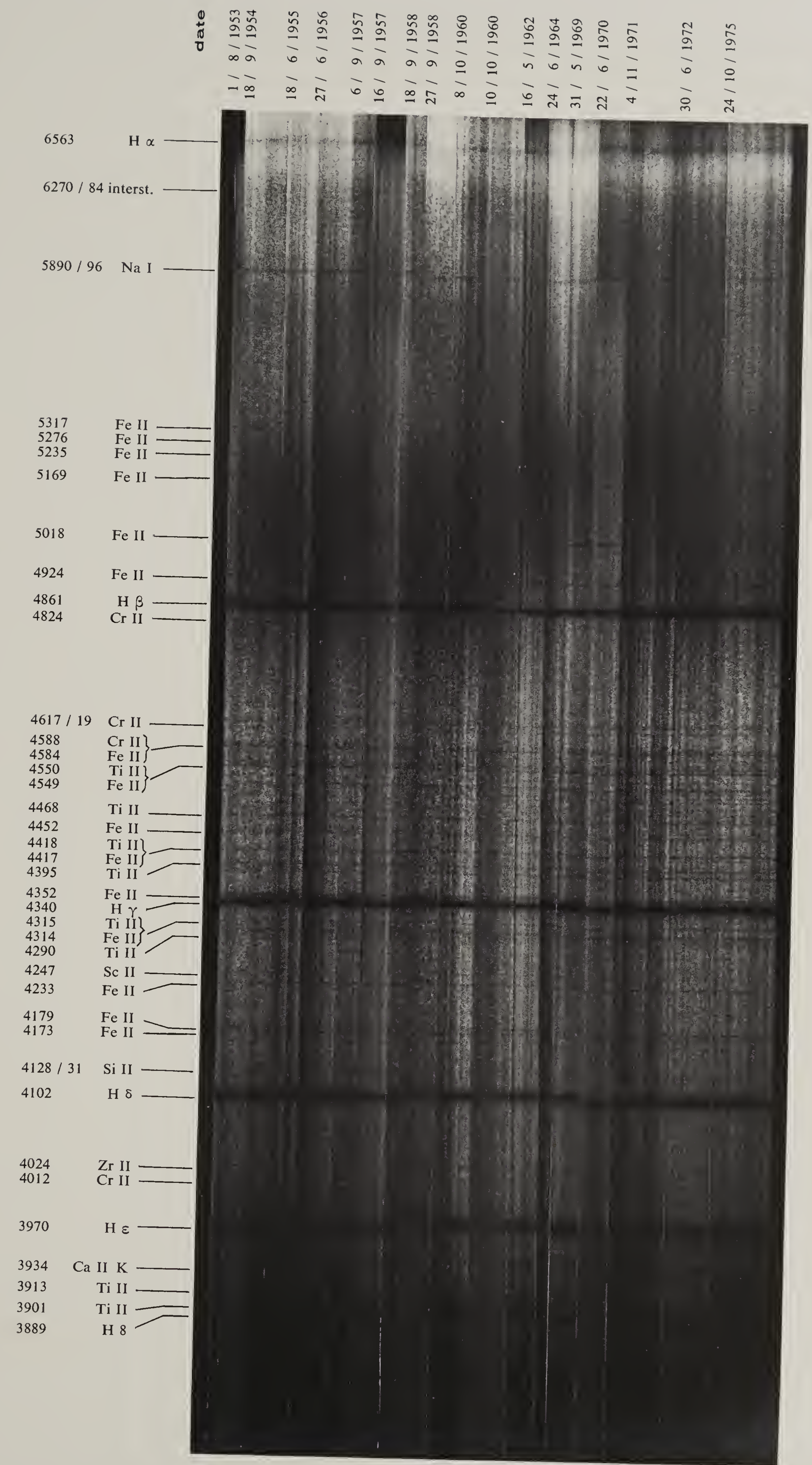
3913 Ti II
3906 Fe II
3901 Ti II
3889 H 8
3835 H 9

HD 195 325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24 / 10 / 1975
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6270 / 84 interst.
5890 / 96 Na I
5317 Fe II
5276 Fe II
5235 Fe II
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4617 / 19 Cr II
4588 Cr II
4584 Fe II
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4549 Fe II
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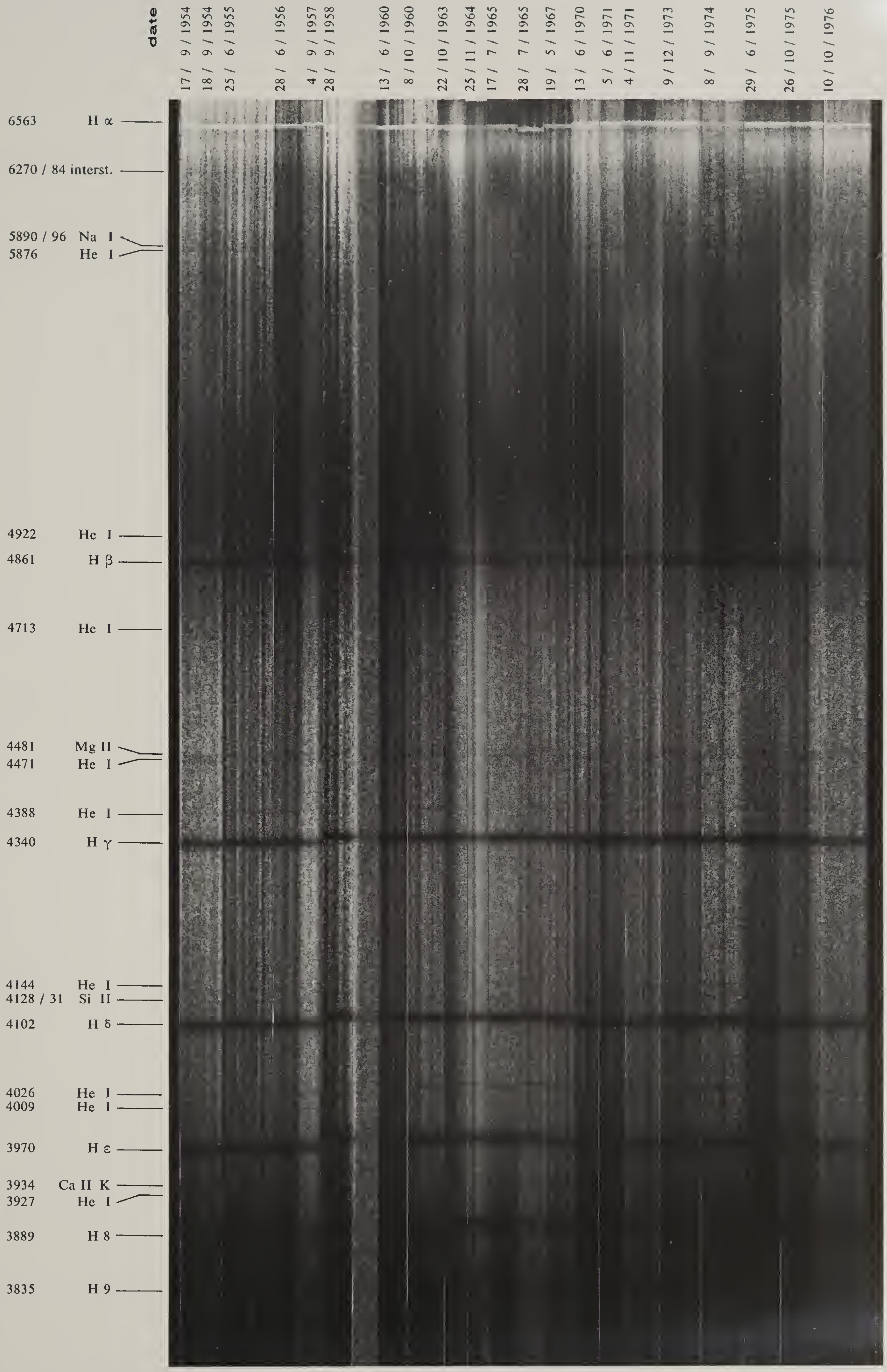
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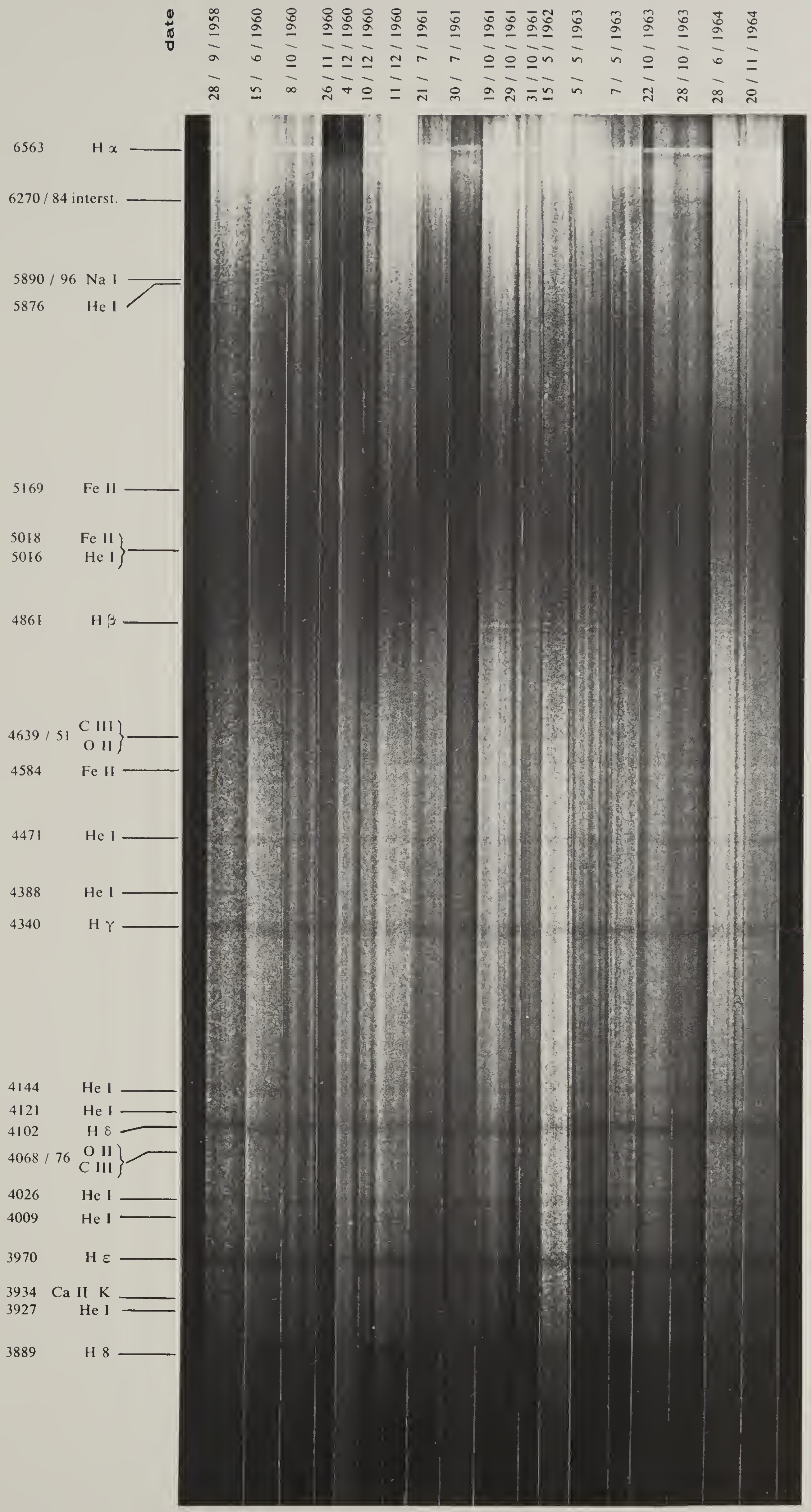
HD 199218

HD 200120 (1)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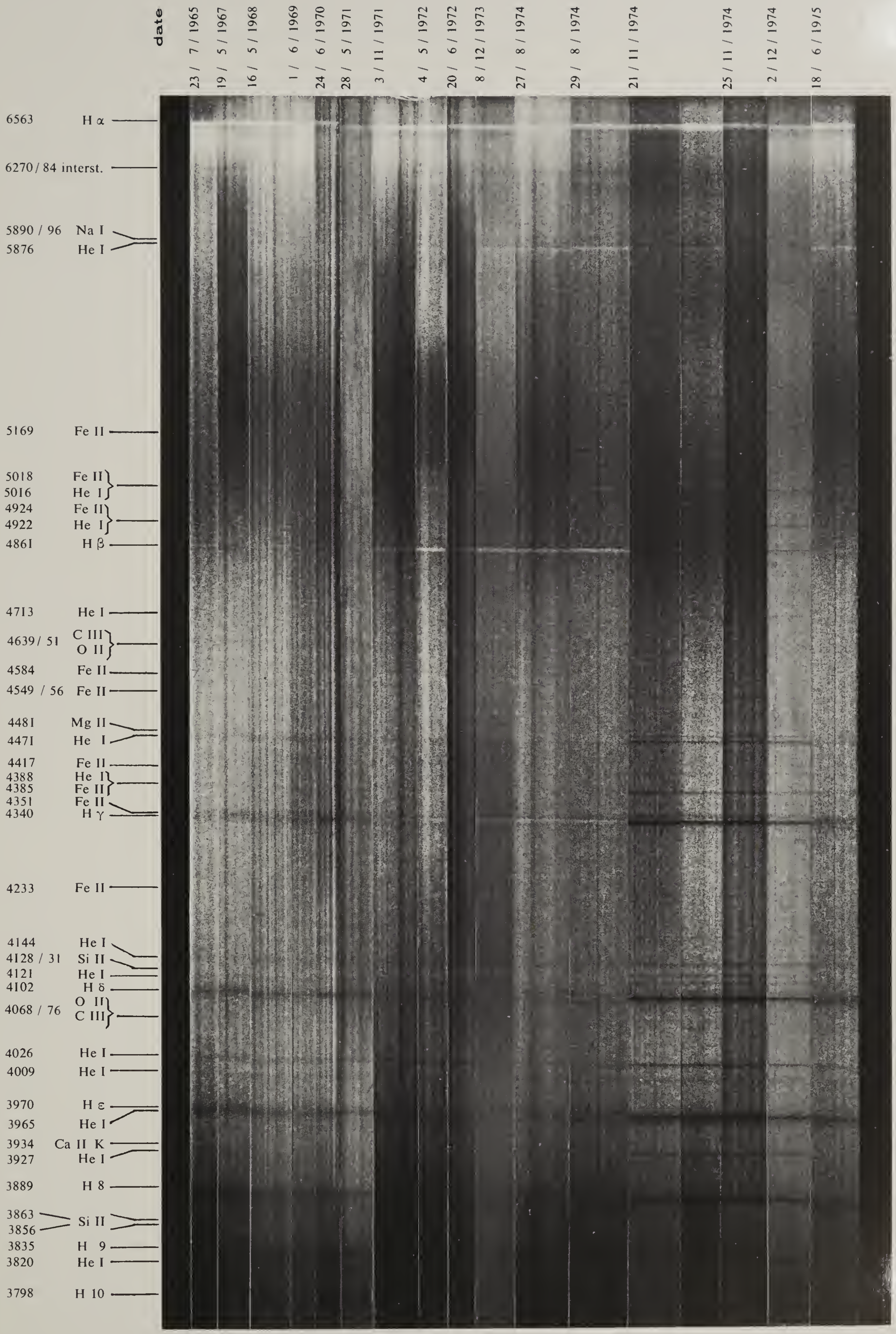
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4233 Fe II
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4128 / 31 Si II
4121 He I
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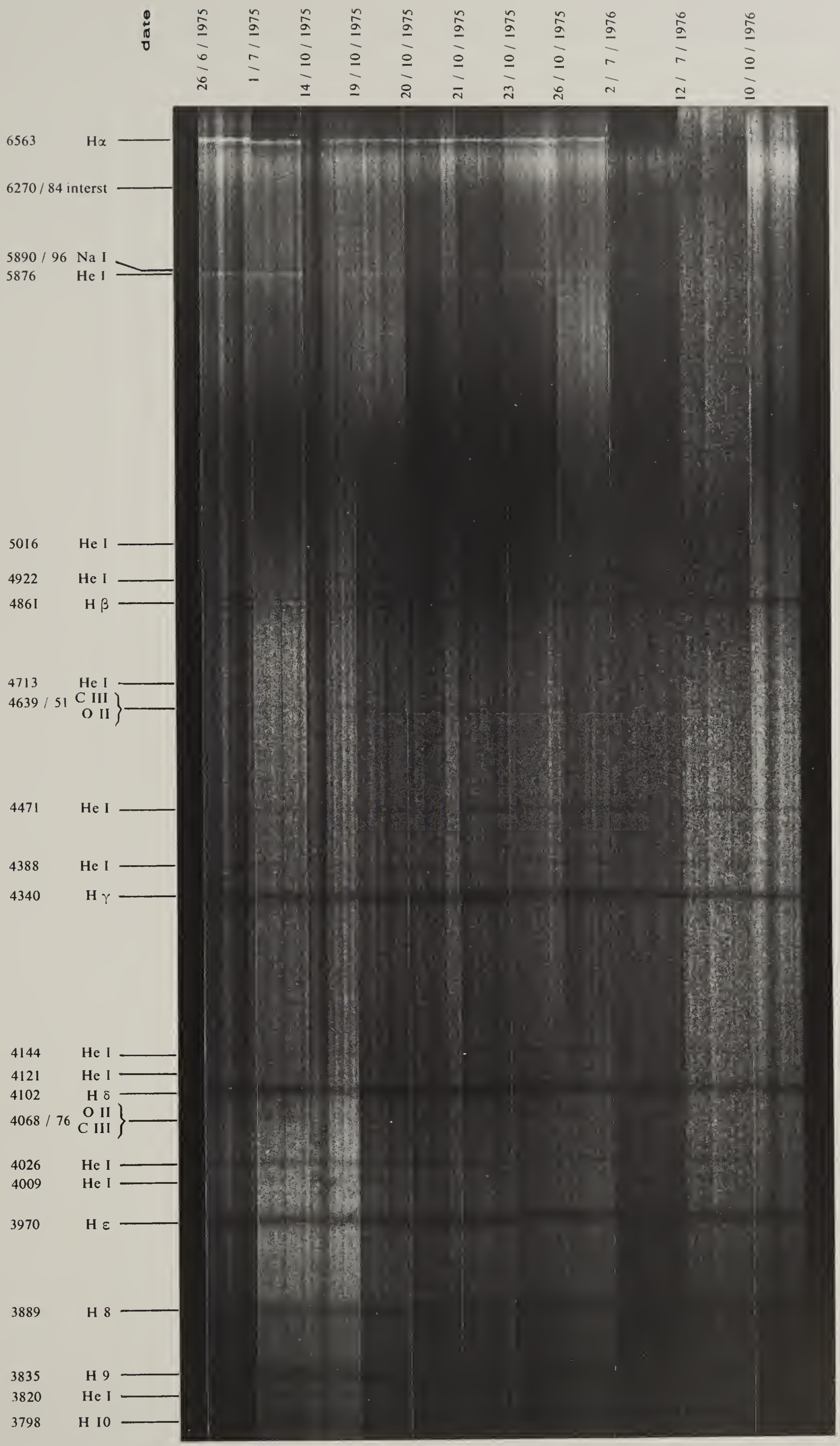
HD 200120 (2)

HD 200120 (3)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5016 He I
4922 He I
4861 H β
4713 He I
4639 / 51 C III O II
4471 He I
4388 He I
4340 H γ
4144 He I
4121 He I
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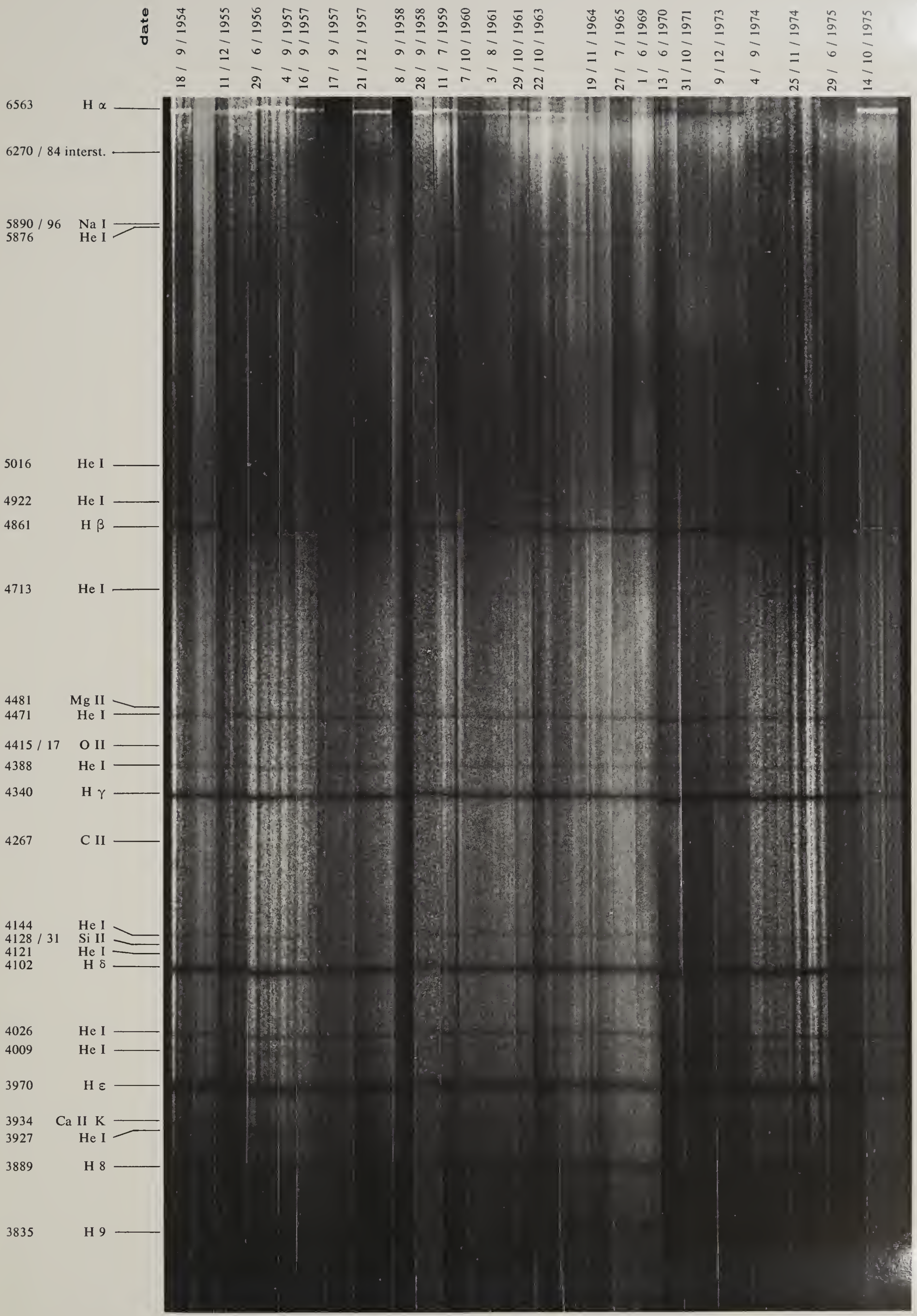
HD 201 733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5890 / 96 Na I
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5016 He I
4922 He I
4861 H β
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4481 Mg II
4471 He I
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4388 He I
4340 H γ
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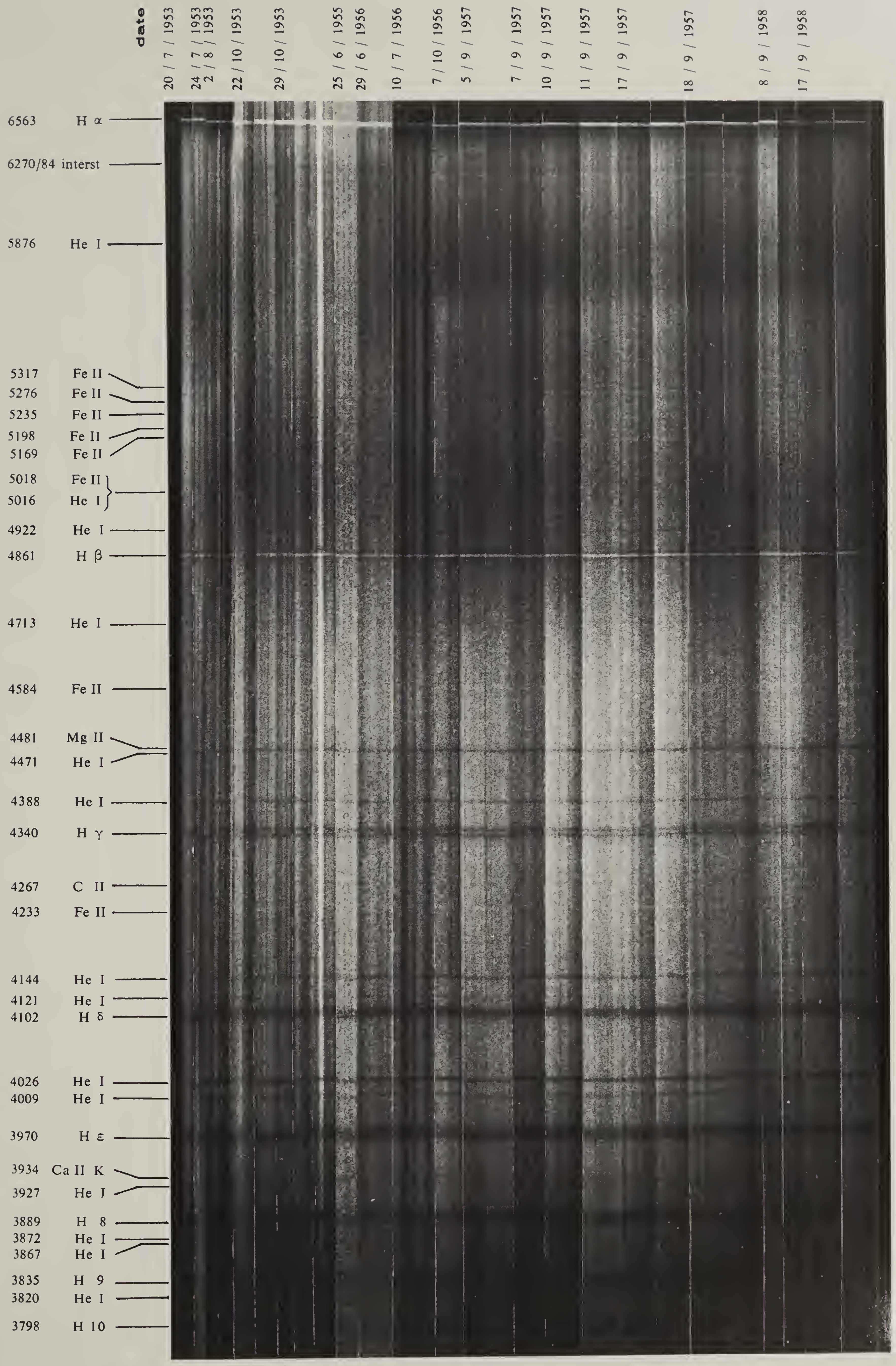
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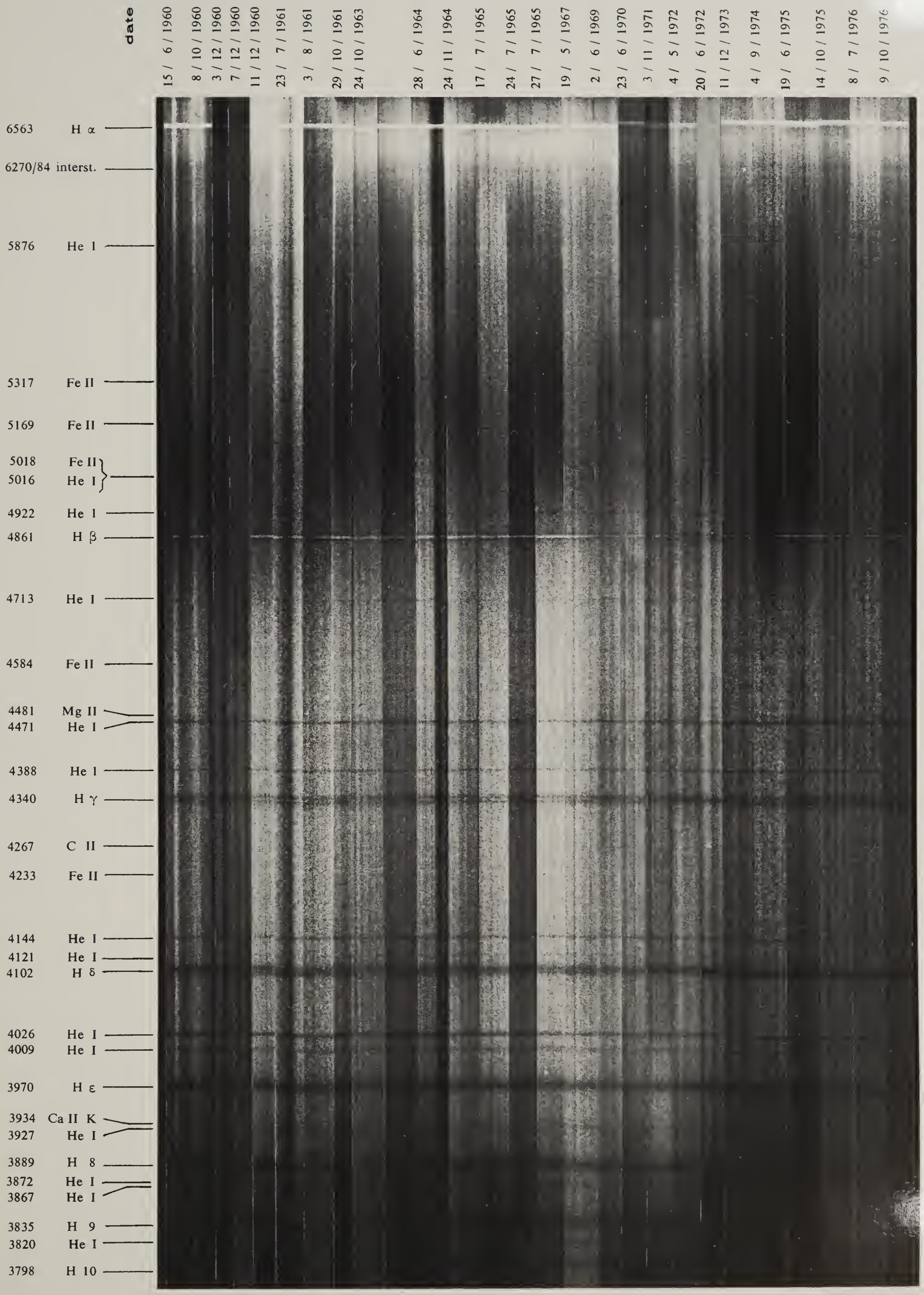
HD 202904 (1)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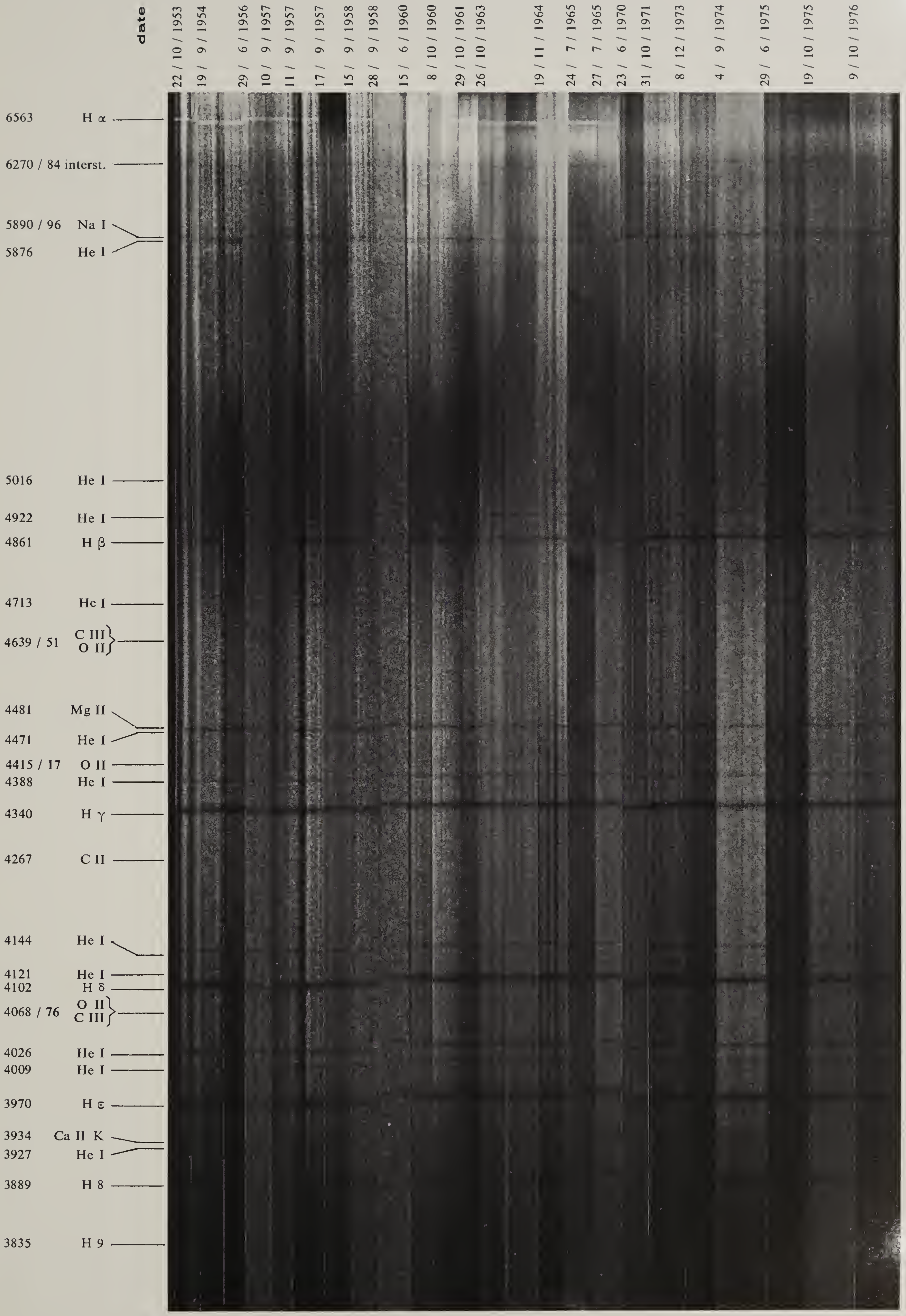
HD 202904 (2)

HD 203 025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5016 He I
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4861 H β
4713 He I
4639 / 51 C III O II
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4471 He I
4415 / 17 O II
4388 He I
4340 H γ
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4144 He I
4121 He I
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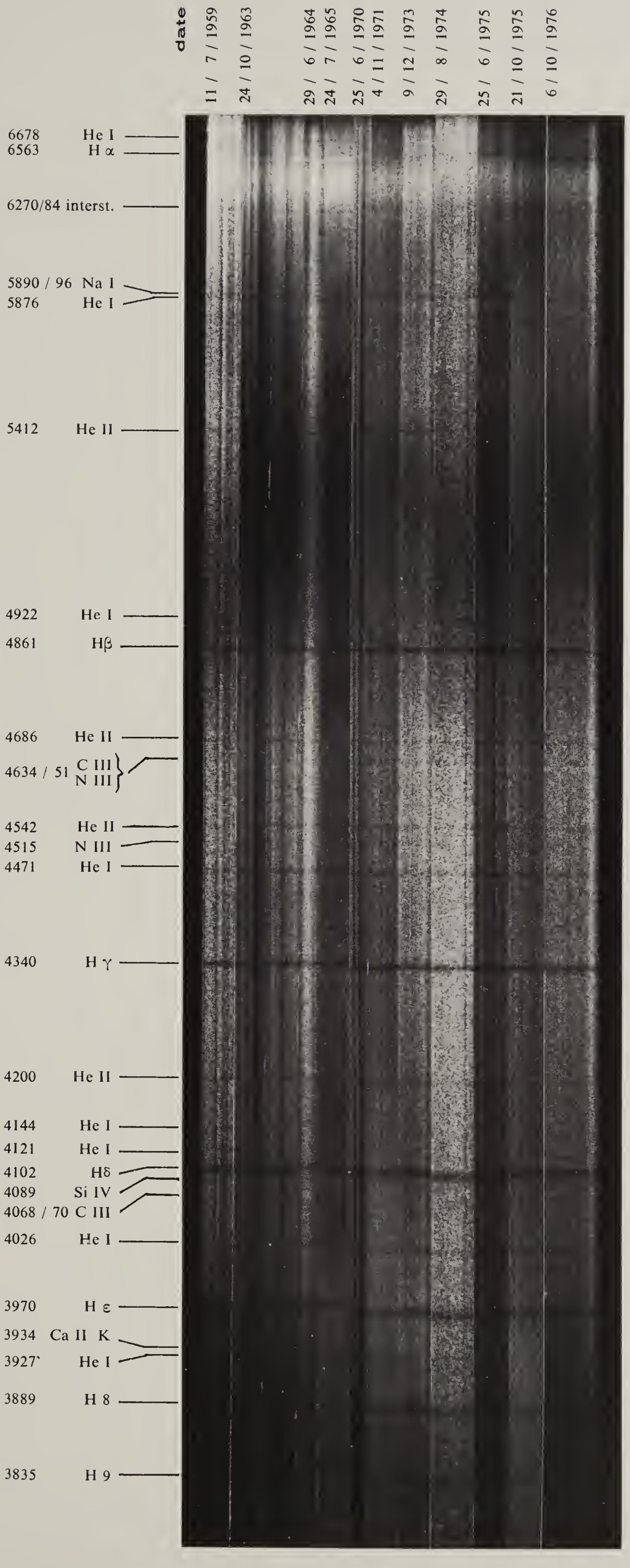
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5890 / 96 Na I
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4634 / 51 C III N III
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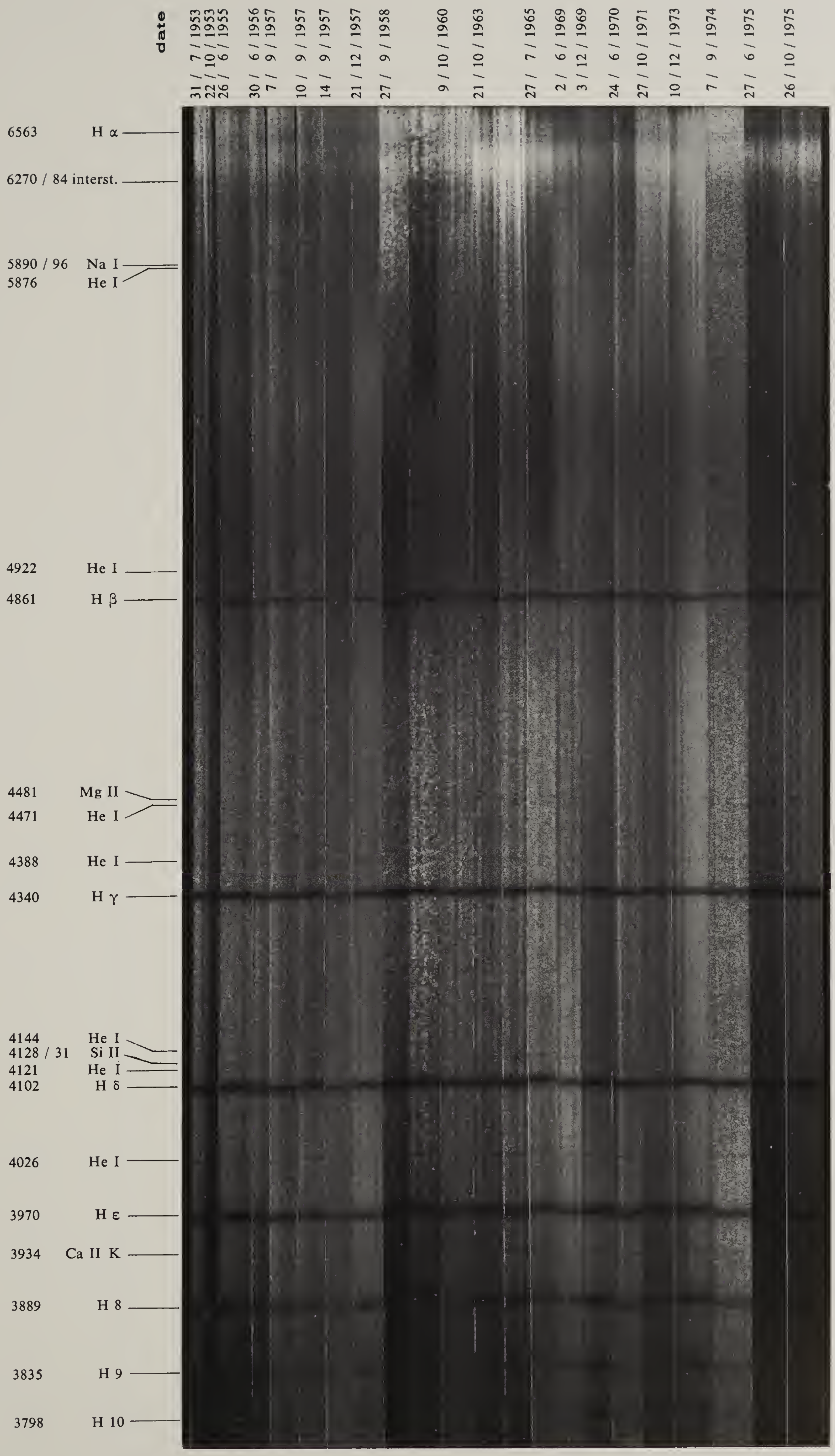
HD 203 064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5890 / 96 Na I
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4861 H β
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4471 He I
4388 He I
4340 H γ
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4128 / 31 Si II
4121 He I
4102 H δ
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HD 205 551

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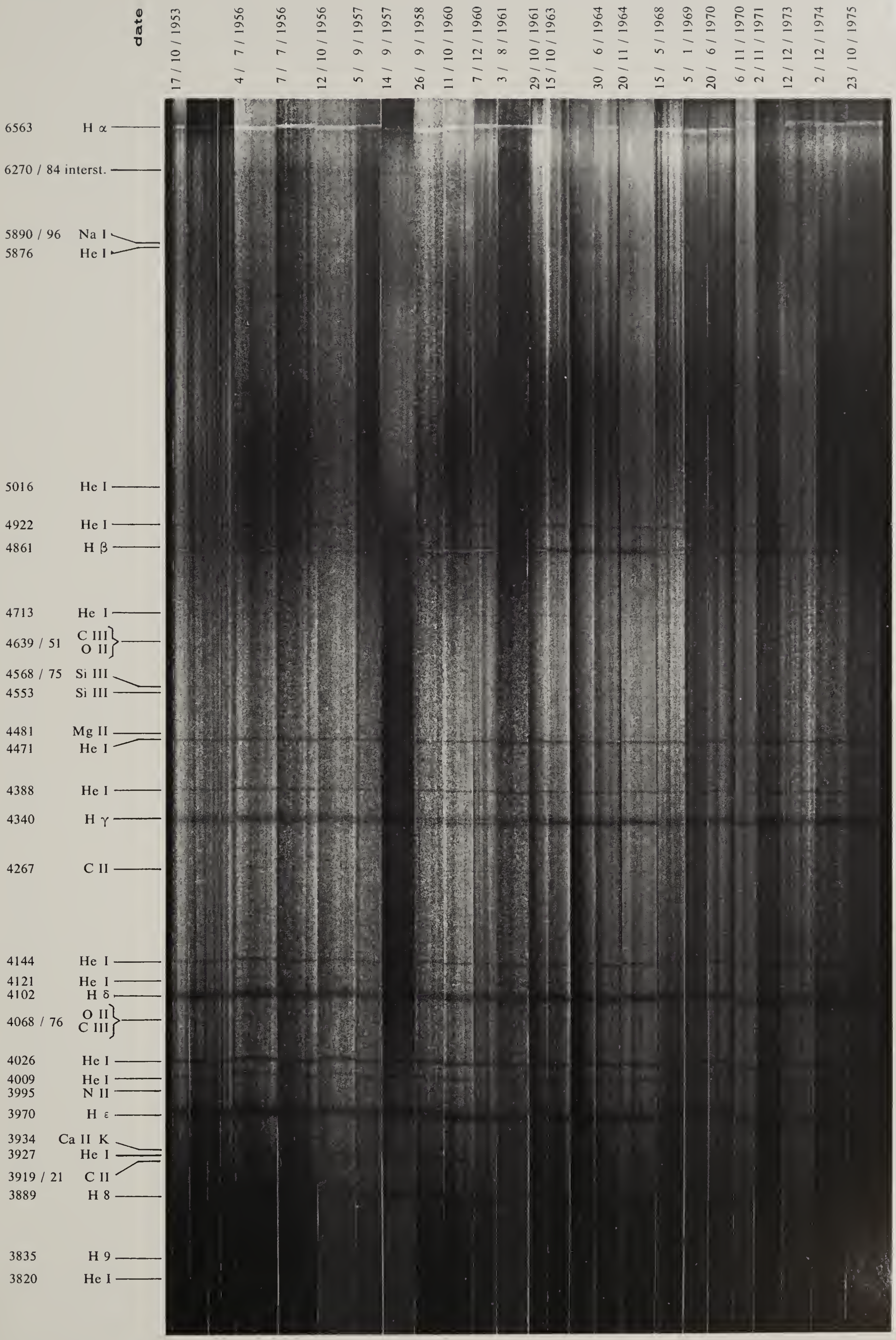
HD 212076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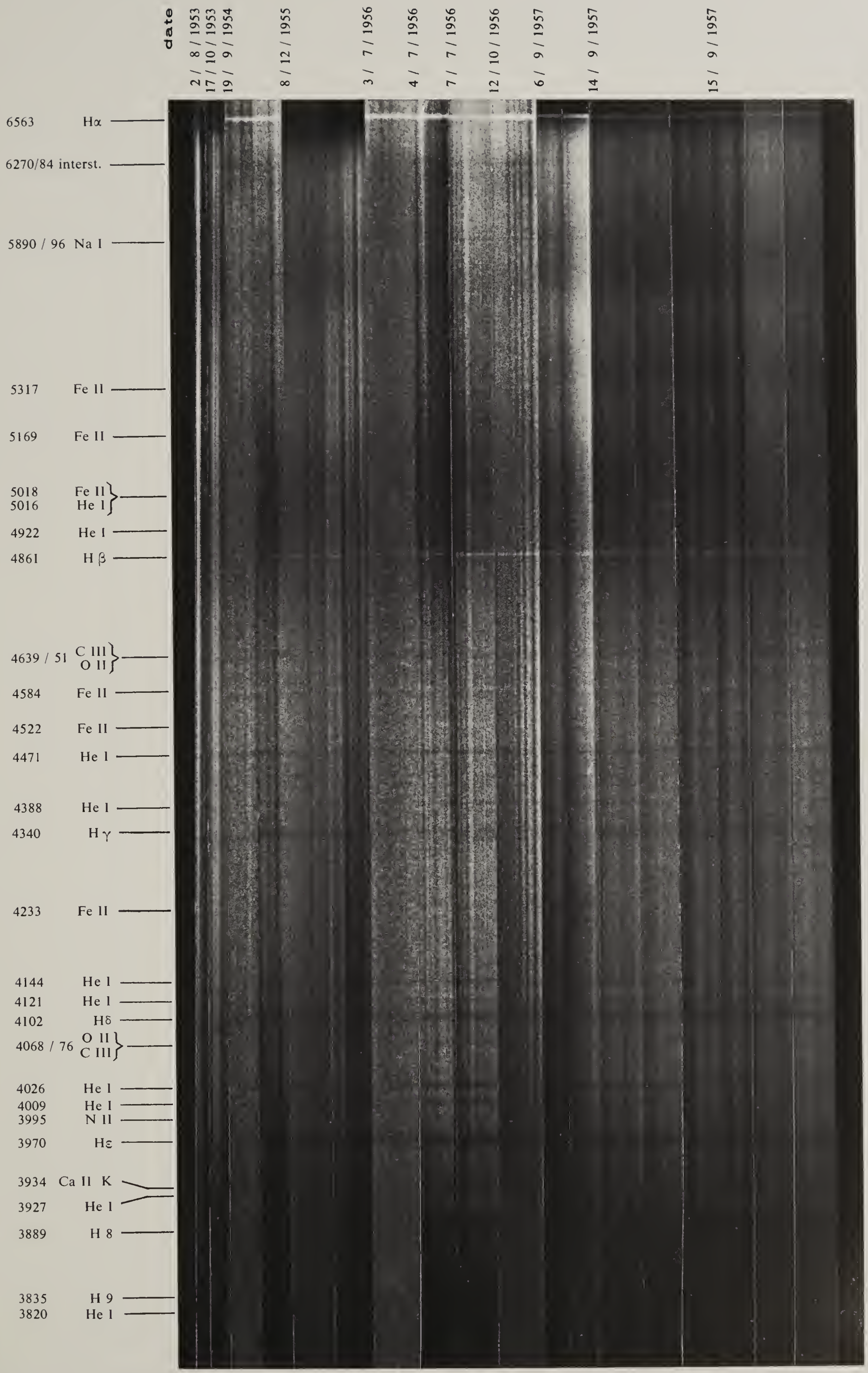
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4068 / 76 O II C III
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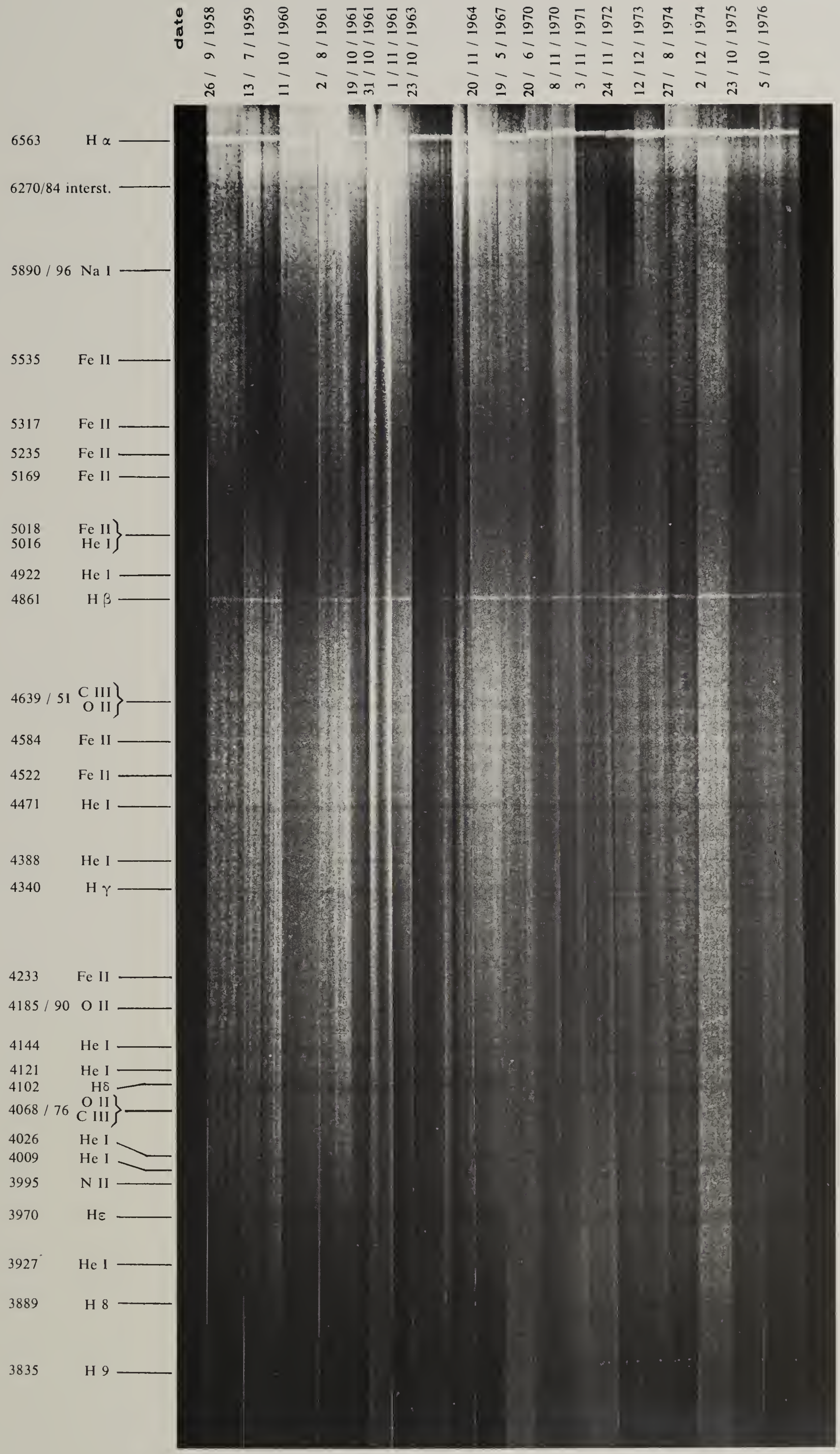
HD 212571 (1)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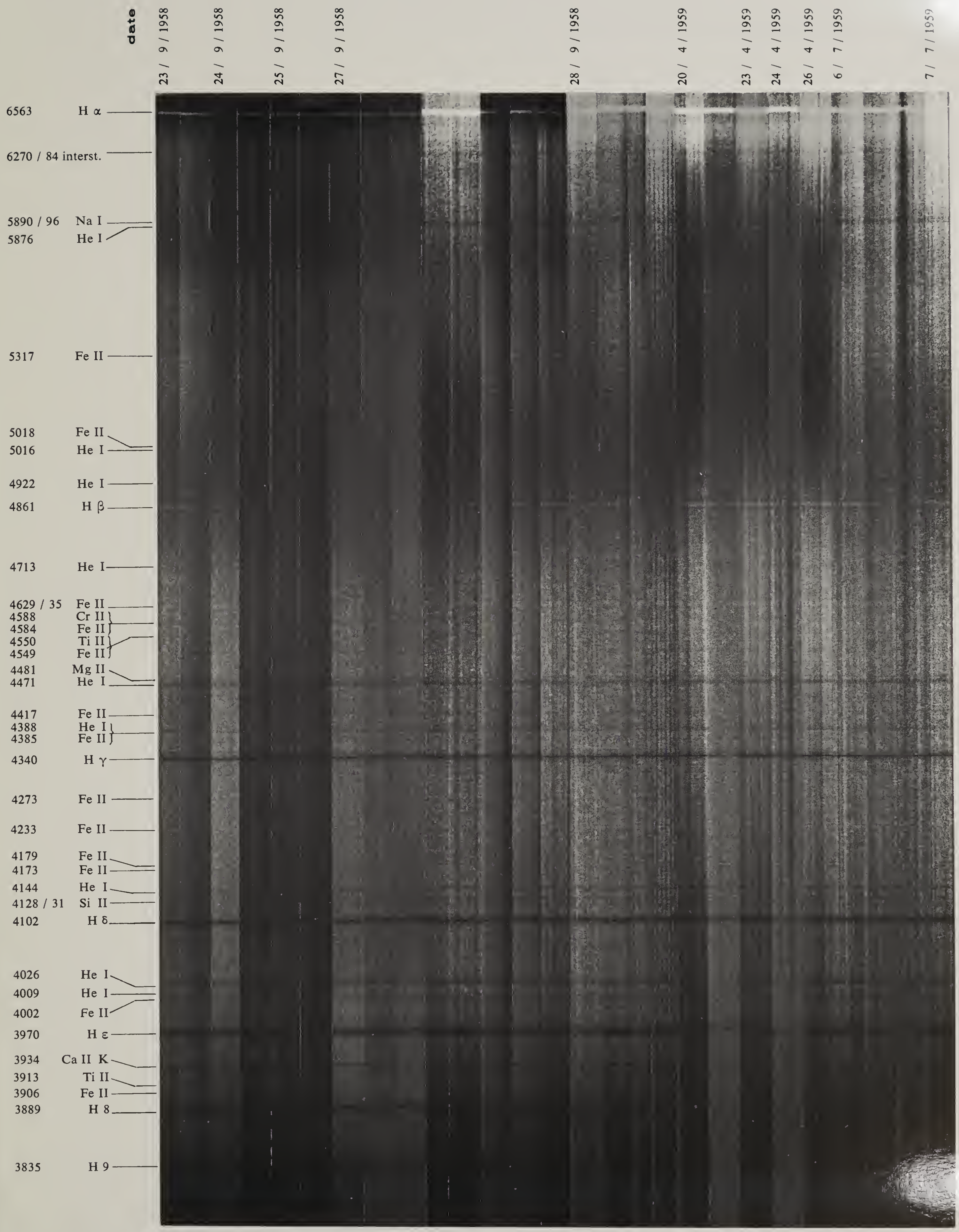
HD 212571 (2)

HD 217 050 (1)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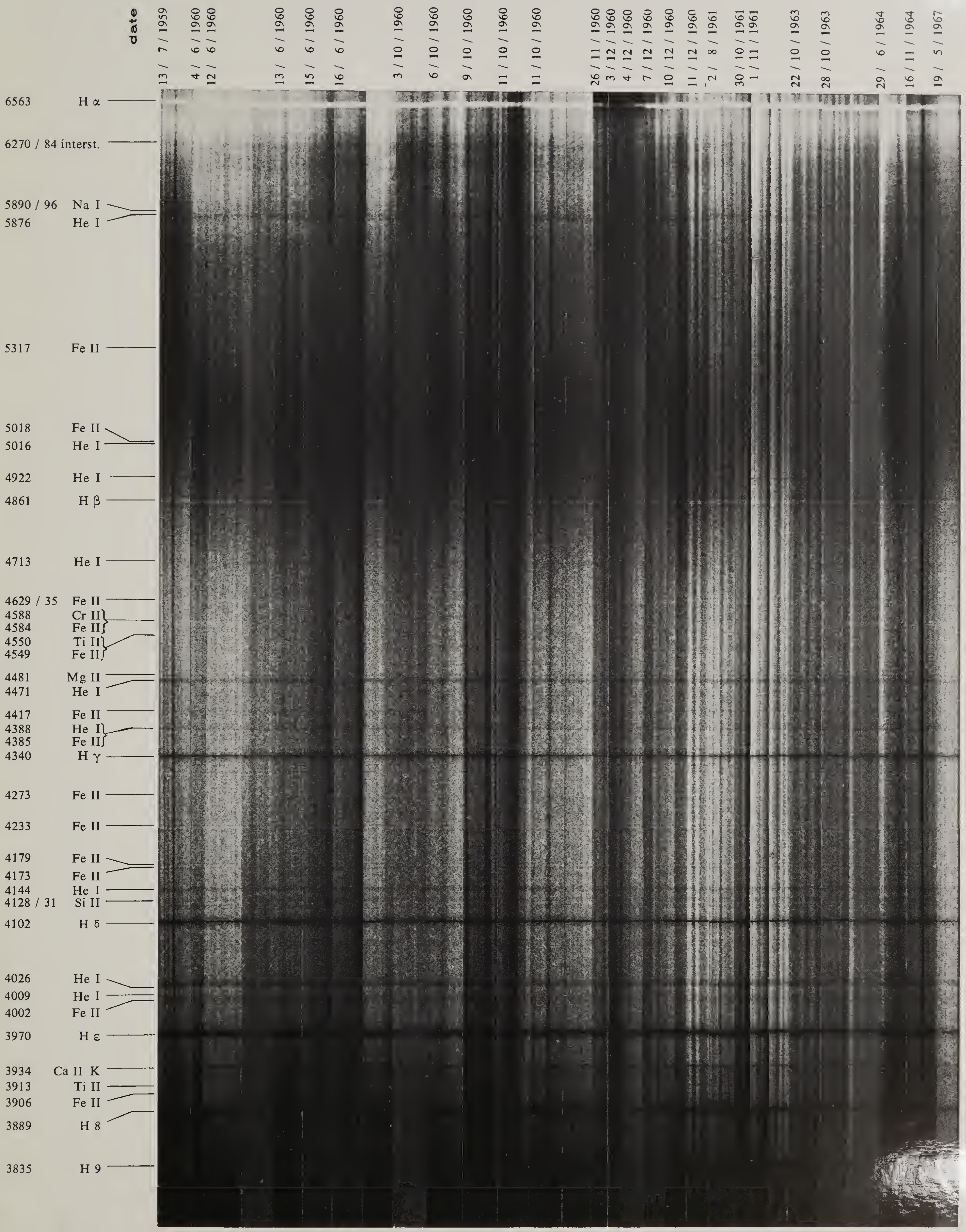
HD 217 050 (2)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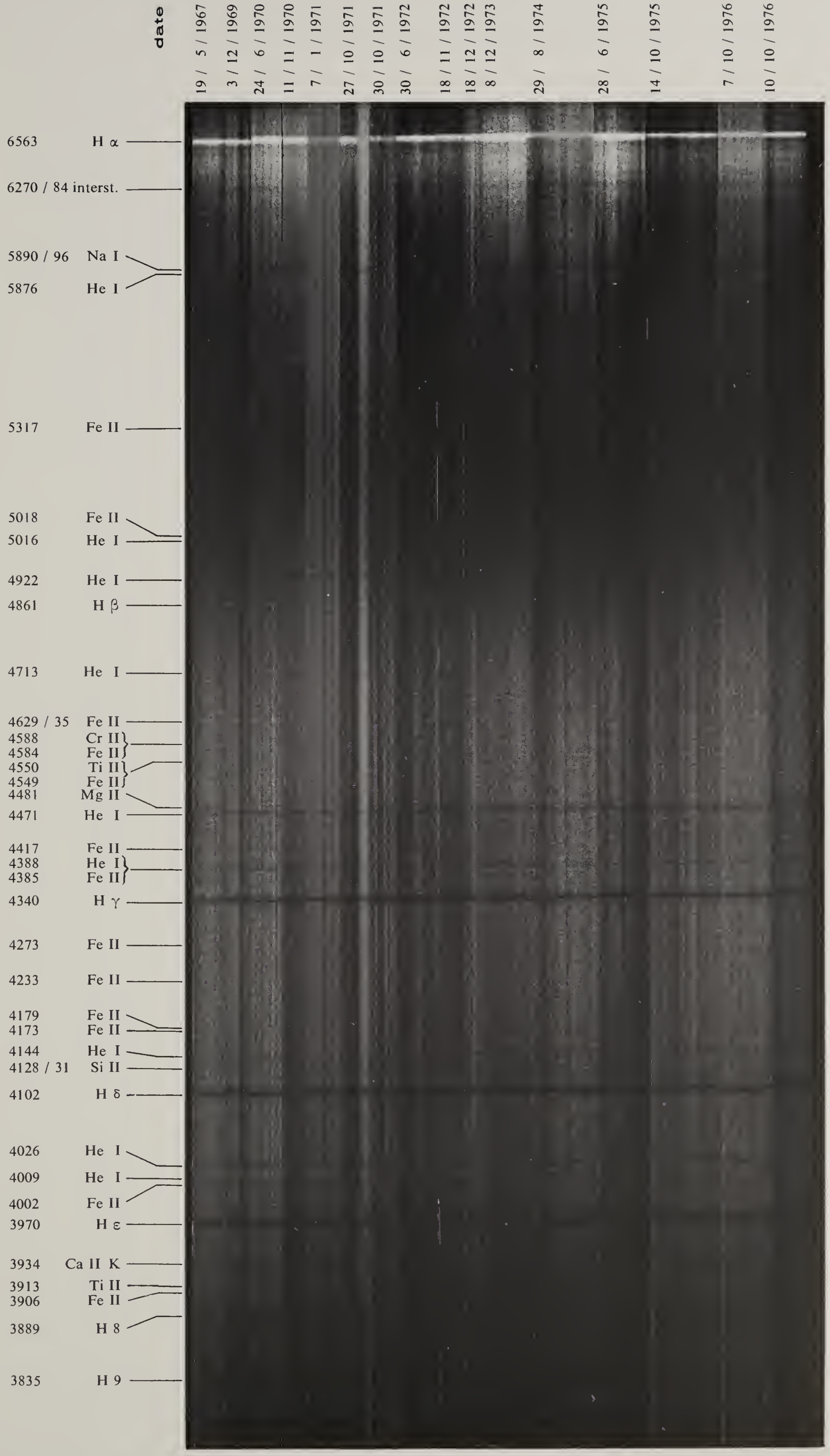
HD 217 050 (3)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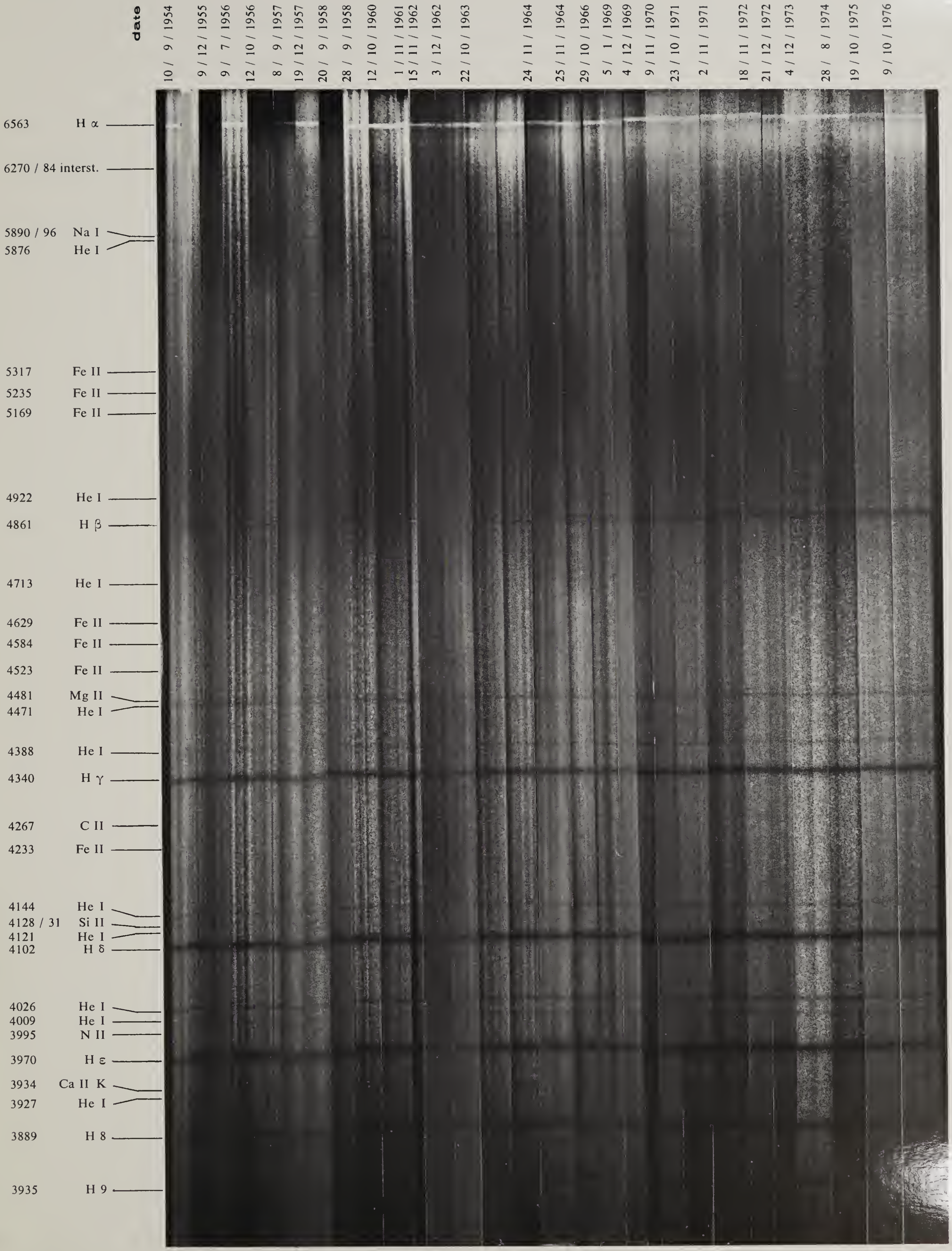
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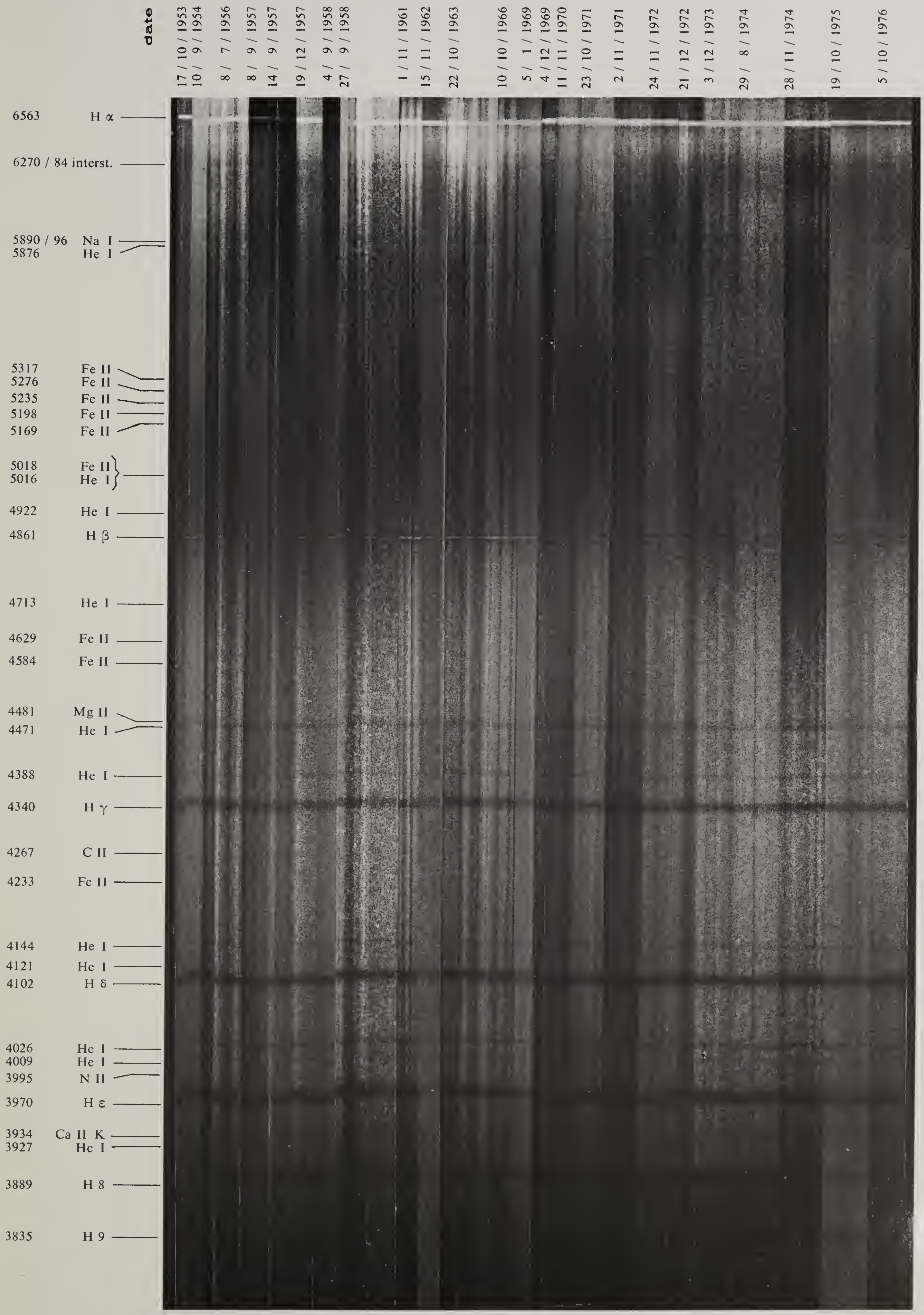
HD 224544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3889 H 8
3835 H 9

HD 224 559